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DEVELOPMENT OF WATER RESOURCES IN APPALACHIA. MAIN REPORT. PART--ETC(U)

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Development of WATER RESOURCES in APPALACHIA

MAIN REPORT
PART III
PROJECT ANALYSES
CHAPTERS 8 thru 10

DALTON RES.
COOSA R. NAV.
STANNARD RES.

OFFICE OF APPALACHIAN STUDIES

DEPARTMENT OF THE ARMY
OFFICE OF APPALACHIAN STUDIES, CORPS OF ENGINEERS
P. O. BOX 1159
CINCINNATI, OHIO 45201

TO: THE READER

This volume ~~(Number 8)~~ is one of six that comprise Part III, "Project Analyses", to the Main Report for Development of Water Resources in Appalachia. The volume contains three of the 20 chapters that make up Part III.

Each chapter generally contains information on how the project was formulated and designed; its estimated costs; the type and value of benefits expected; and the indices of performance. Also included, as appropriate, is information on sharing of project costs among Federal and non-Federal interests, coordination carried out during the planning process, and conclusions reached. See Part II, Sub-Regional Plans, for the economic impact of each project on the region.

Chapters 8 and 9 were prepared by the U.S. Army Engineer District, Mobile. Chapter 8, Dalton Reservoir Project, presents a plan for a multiple purpose reservoir development on the Conasauga River, about six miles southeast of Dalton, Georgia. Chapter 9, Coosa River Navigation Project, presents a current reevaluation of the economic justification for the authorized Coosa River Navigation Project from Montgomery, Alabama, to Rome, Georgia. Chapter 10, Stannard Reservoir Project, prepared by the U.S. Army Engineer District, Buffalo, presents a plan for a multiple purpose reservoir development on the Genesee River, about four miles south of Wellsville, New York.

The Summary Report (Part I, Volume 1) should be consulted for recommendations made as a result of the information presented in this volume. A volume index for the Main Report and its nine supporting Appendices is included on the next two pages for your convenience.

JOHN C. H. LEE, JR.
Colonel, Corps of Engineers
Director

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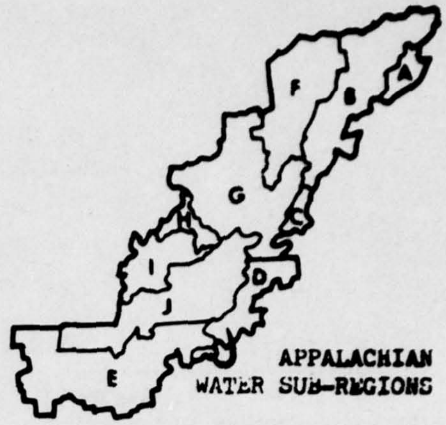

REPORT
For
DEVELOPMENT OF WATER RESOURCES IN APPALACHIA

VOLUME INDEX

MAIN REPORT

Volume Number	Part Number	Chapter Number	Contents
1	I	-	Summary Report
2	I	-	Key Map Folio (By States)
3	II	1	Water Sub-Region A Today
		2	Shaping the Plan for Sub-Region A
		3	Water Sub-Region B Today
		4	Shaping the Plan for Sub-Region B
		5	Water Sub-Region C Today
		6	Shaping the Plan for Sub-Region C
4	II	7	Water Sub-Region D Today
		8	Shaping the Plan for Sub Region D
		9	Water Sub-Region E Today
		10	Shaping the Plan for Sub-Region E
		11	Water Sub-Region F Today
		12	Shaping the Plan for Sub-Region F
5	II	13	Water Sub-Region G Today
		14	Shaping the Plan for Sub-Region G
		15	Water Sub-Region H Today
		16	Shaping the Plan for Sub-Region H
		17	Water Sub-Region I Today
		18	Shaping the Plan for Sub-Region I
		19	Water Sub-Region J Today
		20	Shaping the Plan for Sub-Region J
6	III	1	Introduction to Project Analyses
		2	Tamaqua Local Protection Project
		3	Royal Glen Reservoir
		4	Hipes Reservoir
7	III	5	Clinchfield Reservoir
		6	Roaring River Reservoir
		7	Curry Creek Reservoir
8	III	8	Dalton Reservoir
		9	Coosa River Navigation
		10	Stannard Reservoir
9	III	11	St. Petersburg Reservoir
		12	Greenbrier Reservoirs
		13	Lower Knox Reservoir

REPORT
For
DEVELOPMENT FOR WATER
RESOURCES IN APPALACHIA

VOLUME INDEX

MAIN REPORT (cont'd)

Volume Number	Part Number	Chapter Number	Contents
10	III	14	Whiteoak Reservoir
		15	Logan Reservoir
		16	Midland Local Protection Project
11	III	17	Upper French Broad System (TVA)
		18	Yellow Creek Port (TVA)
		19	Otocsin (Pa.)
		20	Naturealm (Pa.)
12	IV	-	Concepts & Methods
13	V	-	State Water Supplements: Ala., Ga., Ky., Md., Miss., N.Y., N.Car.
14	V	-	State Water Supplements: O., Pa., S.Car., Tenn., Va., W.Va.
15	VI	-	History, Coordination & Cooperation

APPENDICES

Volume Number	Appendix Designation	Title
16	A	Agriculture, Forestry and Conservation
17	B	Power Supply and Requirements
18	C	The Incidence and Formation of Mine Drainage Pollution
19	D	Water Supply and Water Pollution Control
20	E	Economic Base Study
21	F	Recreation and Aesthetics
22	G	Fish and Wildlife Resources
23	H	Ground Water
24	I	Mineral Industry Resources and Water Requirements

25 Loose Leaf Volume-Errata and Addenda

6

~~REPORT FOR~~ DEVELOPMENT

OF

WATER RESOURCES IN APPALACHIA.

Main Report.

Part III. Volume 8.

~~PART~~ III - PROJECT ANALYSES.

~~VOLUME~~ 8

CHAPTERS 8 thru 10.

8. DALTON RESERVOIR, GEORGIA
9. COOSA RIVER NAVIGATION, ALABAMA & GEORGIA
10. STANNARD RESERVOIR, NEW YORK & PENNSYLVANIA

12 422p.

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REPORT FOR DEVELOPMENT

OF

WATER RESOURCES IN APPALACHIA

PART III - PROJECT ANALYSIS

CHAPTER 8

DALTON RESERVOIR PROJECT

Office of Appalachian Studies

Corps of Engineers

September 1969

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PART III
PROJECT ANALYSES

CHAPTER 8 - DALTON RESERVOIR, GEORGIA

TABLE OF CONTENTS

CHAPTER 8 - DALTON RESERVOIR PROJECT

TABLE OF CONTENTS (cont'd)

CHAPTER 8 - DALTON RESERVOIR PROJECT

TABLE OF CONTENTS (cont'd)

CHAPTER 8 - DALTON RESERVOIR PROJECT

TABLE OF CONTENTS (cont'd)

CHAPTER 8 - DALTON RESERVOIR PROJECT

TABLE OF CONTENTS (cont'd)

CHAPTER 8 - DALTON RESERVOIR PROJECT

LIST OF TABLES

LIST OF TABLES (Continued)

CHAPTER 8 - DALTON RESERVOIR PROJECT

LIST OF TABLES (Continued)

CHAPTER 8 - DALTON RESERVOIR PROJECT

LIST OF EXHIBITS

CHAPTER 8 - DALTON RESERVOIR PROJECT

LIST OF EXHIBITS

CHAPTER 8 - DALTON RESERVOIR PROJECT

LIST OF EXHIBITS

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PART III
PROJECT ANALYSES

CHAPTER 8 - DALTON RESERVOIR, GEORGIA

SECTION I - SUMMARY

1. PHYSICAL DESCRIPTION

The site of the Dalton Reservoir multiple-purpose project is located in the Appalachian Valley, in Whitfield and Murray Counties, northwest Georgia, about 6 miles southeast of the city of Dalton. The project, with a 75-foot-high dam located on the Conasauga River 24.8 miles above its mouth, would control a 624-square-mile drainage area in the headwaters of the Alabama-Coosa River Basin. The location is shown on exhibit 8-1.

Major physical features of the project would be a 626-foot-long gated spillway structure flanked by concrete nonoverflow sections, 114 feet long and tied to high ground by earthen dams of a total length of 1,540 feet; a reservoir of a total storage capacity of about 186,000 acre-feet (equivalent to 5.6 inches of runoff from the contributing drainage area) and a surface area of 8,650 acres; and 5,600 acres of land with appropriate public-use facilities for recreation and reservoir fishing. Associated with the project would be six public access sites (primarily for fishermen), spaced along the Conasauga River reach below the dam.

2. PROJECT IMPACTS

The reservoir project has been planned to provide for the area's water-related needs and thus stimulate and support economic growth. Streamflow provides the present water needs of the area and is the best potential for future needs due to the lack of groundwater and/or the high cost of development of supply from this source. The specific benefits stemming from the project would be:

a. Water supply

b. Water quality control

c. Flood damage reduction

d. Outdoor recreation

e. Fishery and waterfowl enhancement

f. Economic development

More than one-fourth of the reservoir storage would serve the combined needs for water supply in and near the city of Dalton and for water quality control in the Conasauga River as well as the quality of the Oostanaula River at Calhoun and Rome where streamflow provides the water needs. Flood damages would be considerably reduced along about 73 miles of the river system south of the dam. Farms in the valleys of the Conasauga and Oostanaula Rivers, as well as the urban centers of Calhoun and Rome, would benefit from the project. The reduction of flood stages would result in new flood plain acreage becoming available for more intensive use.

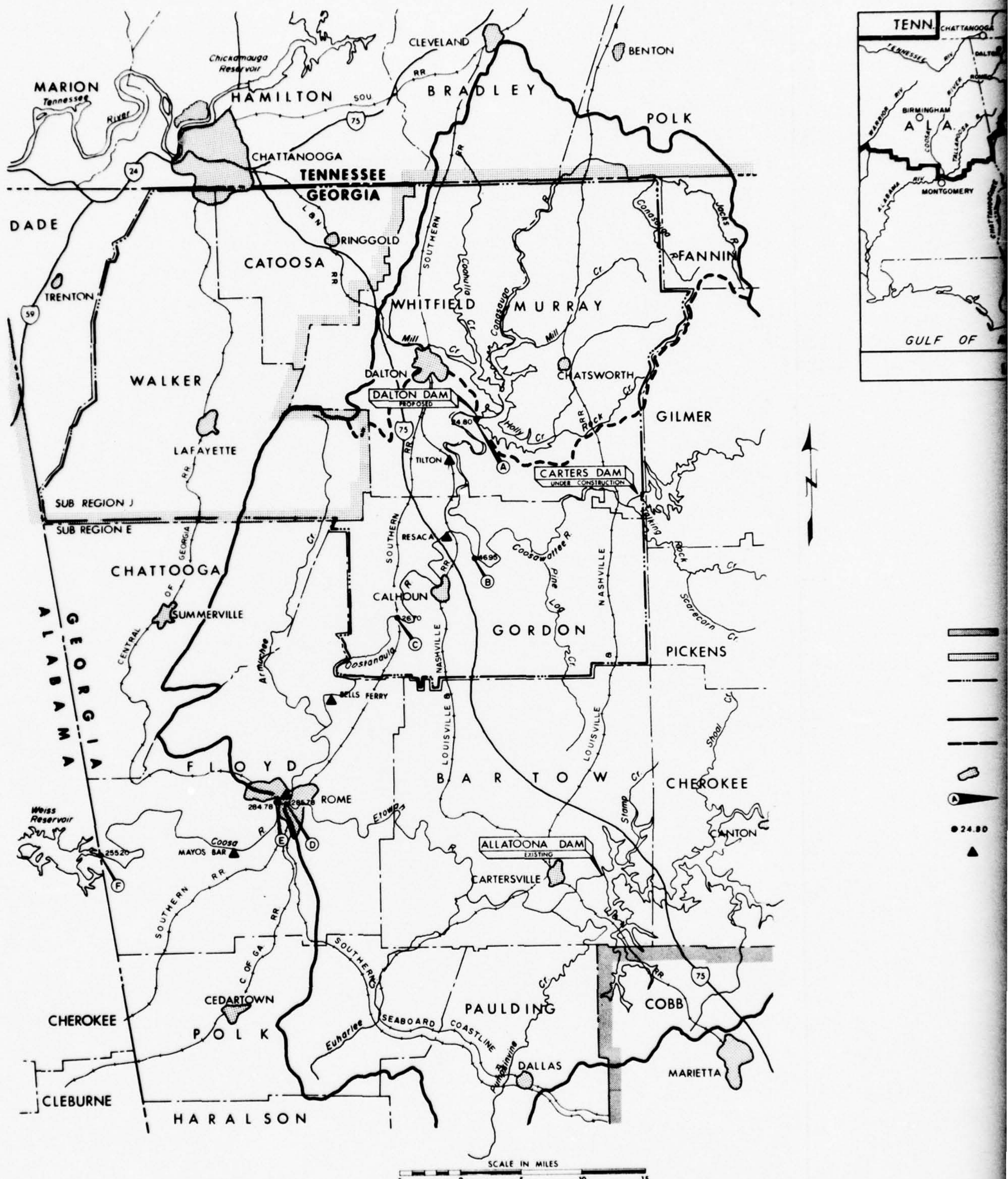
Extensive new opportunities for water-related recreation would be provided by the reservoir with its irregular shoreline. Additional general outdoor recreation needs would be met on project lands. Reservoir fishing facilities and angler sites on the stream reach below the dam would provide a substantial gain in fishing opportunities. Project-occasioned works would conserve existing trout fisheries in the streams emptying into the reservoir. Part of the existing hunting opportunities would be lost as a result of building the project. However, measures under the plan, including intensive management of 6,300 acres for upland game and waterfowl, would mitigate the losses. Economic development attributable to the project would result from additional job opportunities created both during and after project construction.

3. COST AND BENEFITS

Costs for constructing Dalton Dam and Reservoir, including all project lands and works, are estimated at $44.3 million; annual charges would be about $1.95 million. Correspondent values for associated development investments are approximately $2.33 billion and $70.9 million. Annual benefits stemming from the project are estimated as follows

	Income	
	National	Regional
Benefits:		
User	$2,759,000	$2,663,000
Expansion effects:		
Redevelopment	104,000	464,000
Development (rounded)	4,670,000	160,000,000

Accordingly, the index of performance for the objective of increasing the national income would be 1.4, and that for increasing regional income, 2.2 . (See Section VI.)



CLEVELAND
BENTON
Chickamauga Reservoir
MARION
Tennessee River
HAMILTON
BRADLEY
POLK
SOU
RR
75
CHATTANOOGA
24
TENNESSEE
GEORGIA
DADE
L&N
RINGGOLD
CATOOSA
RR
SOUTHERN
Coahulla Cr
Conasauga R
Jacks R
FANNIN
TRENTON
59
WHITFIELD
MURRAY
Mill Cr
Mill Cr
WALKER
DALTON
CHATSWORTH
DALTON DAM
PROPOSED
24.80
Holly Cr
Rock Cr
RR
GILMER
LAFAYETTE
TILTON
CARTERS DAM
UNDER CONSTRUCTION
SUB REGION J
SUB REGION E
SOUTHERN
RESACA
Coosawattee R.
Talking Rock
Scarecorn Cr
CHATTOOGA
Cr
CENTRAL OF GEORGIA
NASHVILLE
Pine Log Cr
SUMMERVILLE
CALHOUN
GEORGIA
ALABAMA
GORDON
PICKENS
Armuchee Cr
Oostanaula
NASHVILLE
BELLS FERRY
LOUISVILLE &
LOUISVILLE
Shoal Cr
FLOYD
BARTOW
CHEROKEE
ROME
284.78
Etowah
Weiss Reservoir
Coosa R
MAYOS BAR
255.20
Stamp Cr
CANTON
ALLATOONA DAM
EXISTING
CARTERSVILLE
SOUTHERN RR
C OF GA RR
SOUTHERN
CEDARTOWN
PAULDING
COBB
CHEROKEE
POLK
Euharlee
SEABOARD
COASTLINE
Pumpkinvine
DALLAS
MARIETTA
CLEBURNE
HARALSON
75
SCALE IN MILES
5 0 5 10 15
TENN.
CHATTANOOGA
TENNESSEE RIV
BIRMINGHAM
ALA.
MONTGOMERY
GULF OF
24.80

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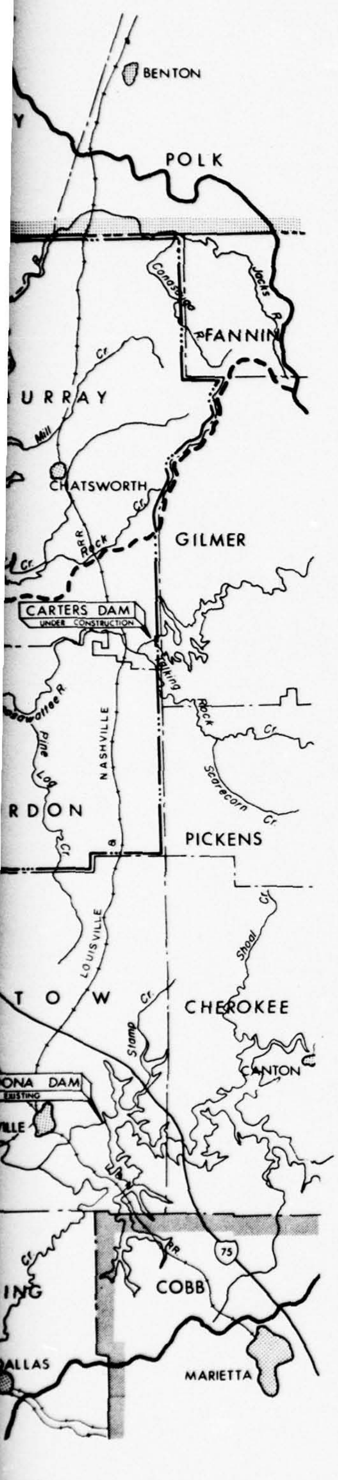

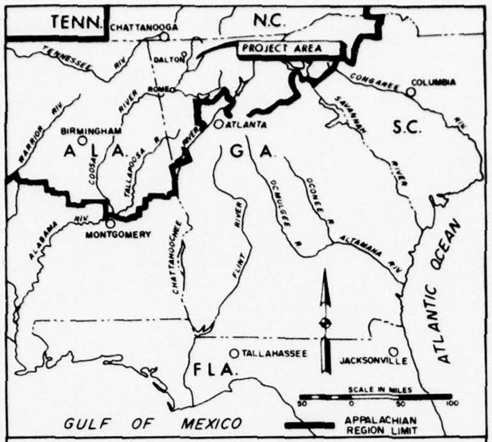

LOCATION MAP

LEGEND

- APPALACHIAN REGION LIMIT
- SUB REGION LIMIT
- *AREAL LIMIT OF DALTON RESERVOIR'S* PRIME ECONOMIC IMPACT
- COOSA RIVER HEADWATERS BASIN DIVIDE
- LIMIT OF WATERSHED CONTROLLED BY DALTON DAM
- CITY, COUNTY SEAT
- LIMIT OF STUDIED FLOOD DAMAGE REACH
- ● 24.80 RIVER MILES ABOVE MOUTH
- ▲ CONTROL POINT(GAGE) FOR FLOOD DAMAGE REACH

COMPREHENSIVE PLAN OF DEVELOPMENT
FOR
WATER RESOURCES IN THE APPALACHIAN REGION
GENERAL MAP
OF
ROME-DALTON GROWTH AREA, GEORGIA

EXHIBIT 8-1

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4. COOPERATION REQUIRED FOR CONSTRUCTION

In accord with present Federal law, costs of the Dalton Reservoir project allocated to water supply, $2 million for construction and $5,000 annually for operation, maintenance, and replacements, would be apportioned to non-Federal interests. The city of Dalton has expressed the intent to bear these costs. The separable costs associated with development for recreation and fish and wildlife enhancement, $7.7 million, would be equally apportioned between Federal and non-Federal interest. The Georgia Legislature will consider committing the State to the non-Federal portion of these construction costs prior to the installation of the pertinent project features. The State meanwhile has expressed willingness to assume the maintenance, operation, and replacement costs of the project's functions for recreation and fish and wildlife enhancement, estimated at $364,000 annually. The Georgia Water Quality Board has given assurances that it would adopt standards for the area streams that would be in keeping with the intended use of the project.

Before construction, local interests should furnish assurances that they would exert control to the full extent of their legal capability against encroachments which would impair efficient reservoir operation and against diversion of streamflow available for water quality improvement.

SECTION II - PROJECT FORMULATION

5. *NEEDS THAT POTENTIALLY CAN BE MET BY DEVELOPMENT OF WATER RESOURCES*

The following paragraphs discuss briefly water and related land resource development needs at Dalton which will have to be met before they become critical constraints on economic growth in the area. Needs in the counties along the river system as far downstream as the Georgia-Alabama State line were evaluated since they could be served to some degree by a reservoir project in the Dalton area.

The average annual flood damages along Conasauga River below the Dalton Dam site, as well as those along the Oostanaula River and the Coosa River reach in Floyd County, are shown in the following table. The location of the streams and damage zones are shown in exhibit 8-1.

TABLE 8-1
AVERAGE ANNUAL FLOOD DAMAGES WITH
CARTERS AND ALLATOONA RESERVOIRS IN OPERATION

Stream and reach		Damage zone From (mile)	To (mile)	Control point	Damages 1/
Conasauga River:	A-B	24.80	0.00 2/	Tilton	$131,100
Oostanaula River:					
B-C		46.95	26.70	Resaca	127,700
C-D		26.70	0.00 3/	Bells Ferry	202,000
Coosa River: 4/					
D-E		285.78	284.78	Rome	30,900
E-F		284.78	255.20	Mayos Bar	160,500
Total					$652,200

1/ Includes allowance for future development in the flood plain expected to take place without flood control projects.

2/ Same as Oostanaula River mile 46.95.

3/ Same as Coosa River mile 285.78.

4/ Coosa Navigation Project will modify river regimen.

Storage of floodflows in Dalton Reservoir would result in substantial reduction of flood stages and damages in the urban centers of Calhoun and Rome and on farmland in the river valleys between Dalton and Rome.

Sufficient relatively flat land is available outside the flood plains for the projected industrial, commercial, and residential expansion in the Dalton-Rome growth area. Flood control, however, would permit more intensive agricultural use of the flood plains.

Municipal and industrial water supply needs at Dalton have been projected by the Federal Water Pollution Control Administration (FWPCA) to grow to 29, 64, and 137 mgd by the years 1980, 2000, and 2020, respectively. (See "Appendix D: Water Supply and Water Pollution Control.") Water supply storage included in the Dalton Reservoir would satisfy these needs.

The industry and populace of Dalton impose a heavy wasteload on the Conasauga River. Even with 85 percent of the sewage's BOD removed, effluent volumes from the treatment plants exceed the stream's assimilative capacity during dry seasons. In Appendix D, the FWPCA has estimated that a total of 226 cfs at the Tilton gage would be required by the year 2020 to control the water quality needs in the Conasauga River below Dalton. This flow would be obtained from releases of the proposed Dalton Reservoir, uncontrolled drainage area flows, and from Dalton's future treated water flows discharged from Drowning Bear Creek into the river below the dam. The releases, integrated with those from Carters Reservoir, on Coosawattee River, would also help augment low flows in the Oostanula River at Rome.

There is a demand for hydropower generation in the basin, but this could be met better by resource development farther upstream in the headwaters of the Conasauga River. The relatively low head that can be provided at Dalton and the need to use the available flow for purposes of greater value to the area's economic growth preclude power generation at the recommended project site. The project would not involve navigation improvement either. However, water quality control releases from the reservoir would meet a small part of downstream power operation and Alabama-Coosa River navigation needs for augmented flows during dry periods.

The Bureau of Outdoor Recreation (BOR) estimates in Appendix F that the gross demand for boating, camping, swimming, and picnicking in the recreation market area of the project would grow by 1980 to nearly 13 million annual activity-days. Growth by the years 2000 and 2020 would be to nearly 23 and 33 million, respectively. Of this demand, 4.3 million can be supported by existing suitable water and land resources, and another portion of recreation needs will be satisfied on and near 3,300 new acres of impounded water made available by 1980. The Dalton Reservoir project, at its minimum level of development for general outdoor recreation, would offer opportunities for 150,000 recreation-days annually, and at its maximum development, an annual use of 2.4 million recreation-days is expected after 1990.

The reservoir, together with project fishery facilities above and below the dam, would provide for a net gain of nearly 192,000 angler-days annually. Project features would prevent encroachment of "rough" reservoir fish into existing trout waters tributary to the impoundment, thus preserving the opportunity for approximately 10,800 man-days of trout fishing in the area. Accomplishing the project plan would cause a loss of 10,725 acres of existing wildlife habitat capable of supporting 4,300 hunter-days annually. Project-connected measures, however, including intensive management of part of the project lands for waterfowl and upland game hunting, would mitigate the damages and support a demand for about 7,700 hunter-days per year.

The Dalton area is a center of economic expansion which needs removal of constraints on future growth and additional impetus for further development. The multipurpose reservoir project would provide for these needs.

6. ALTERNATIVES AVAILABLE FOR MEETING THE NEEDS

Conformance with current policy on preserving national resources required that no funds be expended for a plan if expected benefits could be provided more economically by alternative means.

The following alternatives have been considered, individually and collectively, as appropriate:

a. Structural:

Local flood protection works
Flood proofing
Evacuation of flood plain
Reservoirs in small streams
Forest management and land management programs
Ground water development
Conveying water supplies by pipeline
Instream aeration
Diversion of waste to larger streams
Lagooning of waste and discharging it into high streamflows
Advanced waste treatment
Streamflow augmentation
State-park-type recreation areas
Reservoirs on major streams

b. Nonstructural:

Flood plain zoning
Flood warning system

Localities subject to flooding along Conasauga and Oostanaula Rivers, as well as Rome at the head of the Coosa River, were investigated to determine the feasibility of flood protection by levees, walls, pumping stations, and channel improvements as a primary means of flood control. The flood damage statistics for the two urban centers in the study area, Rome and Calhoun, were examined with a view to segregating developed sections with flood damages so concentrated as to justify local flood protection works. Such projects would have the disadvantage of leaving other areas vulnerable, thereby limiting the area suitable for future development. Preliminary investigations indicated that damages at other localities along the river system between Dalton and Rome were not sufficiently large or concentrated to justify local measures. Reservoirs on major streams in the watershed would provide feasible flood protection for extensive tracts along the Conasauga and Oostanaula Rivers in addition to the urban areas.

Flood proofing is not an economical means of protecting agricultural development, railroads and highways, or large numbers of properties in the flood plain.

Evacuating from the flood plain all development (including the various utilities), estimated at about $38.7 million, is not deemed to be practical.

Studies by the U.S. Department of Agriculture show that reservoirs and land treatment measures on many small headwater tributaries can be effective and economically feasible in providing local water resource services and controlling runoff and sedimentation. Such programs, however, would not be as effective as the recommended Dalton Reservoir in providing the degree of flood protection and water storage needed downstream in the study area. Still the investigated Coahulla Creek and Mill Creek area upstream watersheds projects including land treatment programs above the Dalton Reservoir would result in useful supplements to the benefits arising from the reservoir project. Also, a recent Watershed Work Plan prepared by the Department for the John's Creek watershed, which drains into the Oostanuala River south-southwest of Curryville, would have only minor beneficial effects on flows and sediment load in that river. (See exhibit 8-2.)

Major reservoirs would not afford complete protection to the entire downstream flood plain, but installing such a reservoir might create a false sense of security, which could result in increased developments on a flood-prone lands. Flood plain management as a measure for controlling the use of such lands with a view to guiding development and reducing flood damages would be particularly useful as other measures would not be feasible. The adoption of a flood plain regulation plan by local interests would therefore be necessary to materially reduce flood damage potentials. As a basis for such a plan and to make local people fully aware of the chances of flooding remaining after the provision of a flood control reservoir, a flood plain information study should be made for the area.

A flood warning system is of great value in reducing loss of life and material damage through evacuation of people and property in advance of floods. It is a beneficial supplement to but not a substitute for structural flood reduction measures.

In planning for the water supply needs of the Dalton growth area, ground water resources were determined to be inadequate for the projected municipal and industrial requirements. Conveying water by pipeline from the Coosawattee River or including water supply storage in a multipurpose reservoir near Dalton would be practical solutions.

The following alternatives were considered for meeting present and future water quality control needs in the Conasauga River associated with economic growth in the Dalton area: instream aeration; diversion of waste to streams of greater assimilative capacity; temporary storage of

waste for later discharge into high streamflows; advanced treatment of sewage; and flow augmentation - from ground water or reservoir projects - for dilution of pollutants.

Construction of a major reservoir project provides opportunities for recreation, including fishing and hunting, which also could be made available by a State-park-type development with generally equivalent recreation facilities.

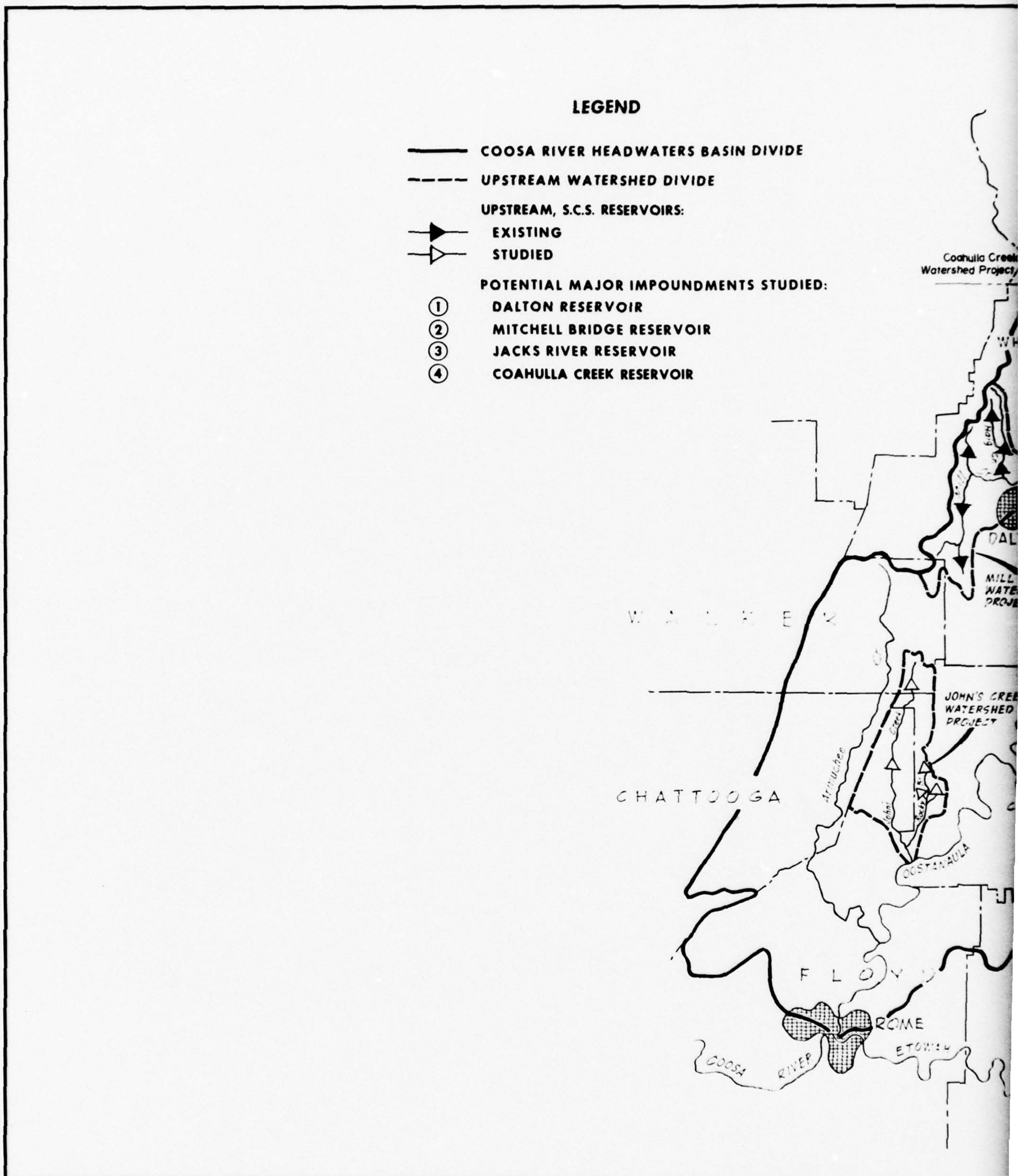
Analyses of the practicable alternatives for providing adequate water supply and water quality control, which are the primary water-related needs for an unhampered, accelerated economic expansion in the Dalton area, showed that multipurpose reservoirs on major streams, supplemented by USDA's upstream watershed projects and land treatment programs, offered the best solutions. Such reservoirs and programs would bring about a most efficient utilization of the water and related land resources of the region by combining also the potential purposes of flood control, better land use, hydropower generation, and general outdoor recreation.

To formulate an optimum plan, four potential reservoir projects with favorable topography were studied by comparing their cost with the benefits that would be derived and with the least costly alternatives for achieving the several purposes. These alternatives are as follows: For water supply, a raw-water pumping plant and a transmission system from the Coosawattee River; for water quality control, tertiary treatment facilities; for flood damage reduction, a single-purpose flood control reservoir at the recommended site; and for general outdoor recreation, a State-park-type development providing generally equivalent recreation opportunities. As hydropower generation, both conventional and pumped-storage, proved to be uneconomical at the investigated sites, no relevant least cost alternative was considered. In addition to the water-related purposes which would be served by the multipurpose reservoirs, consideration was given to the economic impact the projects would have locally and nationally. The local impact would result from creating new employment opportunities in the area, and the national, from providing employment to workers who, without the project, would remain unemployed or underemployed.

7. EVALUATION OF BENEFITS AND COSTS FOR ALTERNATIVES

Benefits

A discussion of each of the benefits, the monetary value thereof, and the effect of operational and other requirements on a reservoir project in providing them are presented in the following paragraphs. All benefits were converted to an equivalent average annual amount over the 100-year period beginning in 1975, based on a 3.25-percent interest rate. Detailed data are presented in Section V of this chapter.


LEGEND
COOSA RIVER HEADWATERS BASIN DIVIDE
UPSTREAM WATERSHED DIVIDE
UPSTREAM, S.C.S. RESERVOIRS:
EXISTING
STUDIED
POTENTIAL MAJOR IMPOUNDMENTS STUDIED:
① DALTON RESERVOIR
② MITCHELL BRIDGE RESERVOIR
③ JACKS RIVER RESERVOIR
④ COAHULLA CREEK RESERVOIR
Watershed Project
WALKER
CHATTOOGA
Armuchee
OOSTANAULA
ROME
COOSA RIVER
ETOWAH

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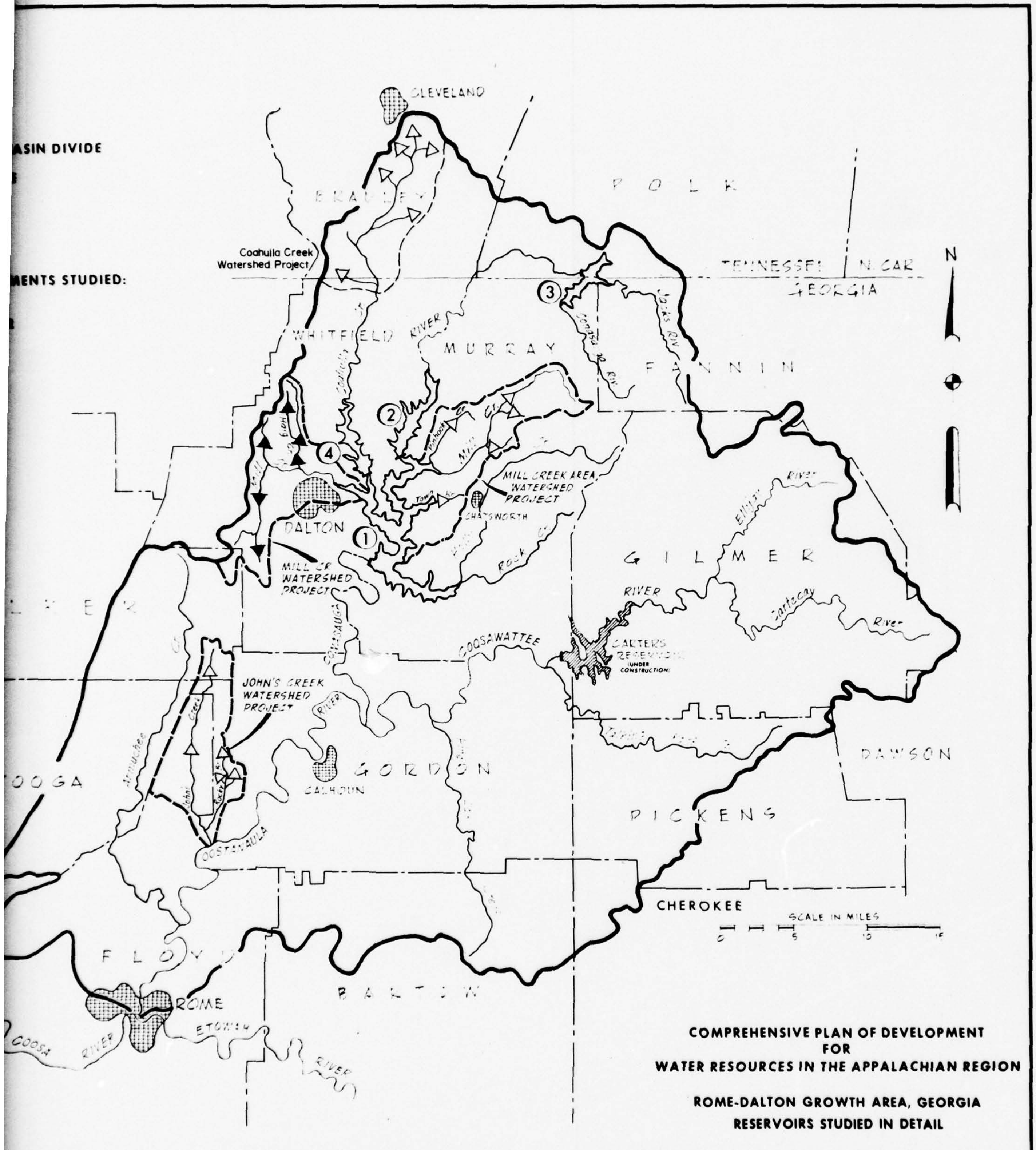

COMPREHENSIVE PLAN OF DEVELOPMENT
FOR
WATER RESOURCES IN THE APPALACHIAN REGION

ROME-DALTON GROWTH AREA, GEORGIA
RESERVOIRS STUDIED IN DETAIL

EXHIBIT 8-2

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Water Supply

Based on economic projections provided by the Corps of Engineers, the FWPCA established the Dalton area demand for water supply to the year 2020. The FWPCA report, included in Appendix D, concludes that the present source, the Conasauga River, should become deficient before 1980. Since the river has very limited low flows during extended dry periods, local interests would have to turn to a different source for their future supply. The benefits accruing from satisfying the future demand from a multipurpose reservoir equal the savings in cost by pumping water from such a reservoir instead of from the Coosawattee River and conveying it by pipeline to the Dalton purification plant. The annual equivalent costs of this single-purpose water supply project would be $695,000 for interest on and amortization of investment, operation, maintenance, and major replacements.

Water Quality Control

The FWPCA reports that by about 1980 Conasauga River water quality would have degraded beyond acceptable limits despite development of secondary wastes treatment facilities. As a solution to the problem, FWPCA determined the minimum flow needs to protect water quality in the stream at Dalton through the year 2020. (See Appendix D.) Benefits stemming from provision of augmented flows are assumed to equal the cost of tertiary treatment of wastes, which is the most economical potential alternative for providing an acceptable quality of water in the stream. Annual equivalent costs for tertiary treatment facilities for meeting the needs over the period to 2020, including operation, maintenance, and major replacements, are estimated at $163,000.

Flood Control

Flood control benefits were determined as the reduction by a project in annual average damages to the development that would take place in the flood plain if such a project would not be built. Flood damage data on which the benefits are based were estimated for the damage reaches extending below a given project along the Conasauga, Oostanaula, and Coosa Rivers to the Georgia-Alabama State line. Damage reduction achieved along these streams with the existing Allatoona Reservoir, on the Etowah River, and Carters Reservoir, now under construction on the Coosawattee River assumed to be in operation, has been taken into account in the analyses of benefits. USDA upstream watershed programs for Talking Rock and Sallocoa Creeks and the Pine Log Tributary now being installed in the Coosawattee River tributaries below Carters Dam will be given further consideration in the preconstruction planning stage when data is available.

Outdoor Recreation

Recreational use, including fishing and hunting, of the Dalton Reservoir and related project lands is expected to provide significant benefits. The Bureau of Outdoor Recreation (BOR) estimates that, at

present, there are adequate resources and facilities to meet the estimated demand of the local recreation market area for boating and camping but there is a deficiency of planned development for swimming and picnicking. The BOR estimate indicates a deficiency of 1,610,000 swimming activity days and 660,000 picnicking activity days. The proposed recreational development of the Dalton Reservoir includes initial plans for facilities to accommodate 700 swimmers and 600 picnickers on an average summer week-end day, which would be ultimately increased to accommodate 3,350 swimmers and 2,700 picnickers. According to the estimated pattern of use, the total initial annual swimming and picnicking activity days would be 66,240 and 55,200, respectively. This annual use would increase to 392,400 swimming days and 327,000 picnicking days during the latter phase of development, when the capacity of facilities at the reservoir will be reached.

The value (or benefits) of a major reservoir for recreation, including fishing and hunting, is determined by the water area and amount of suitable land around the reservoir. For the Dalton Reservoir project, land and facilities were assumed to have been provided as necessary to permit optimum development of the recreation potential.

The BOR report included in Appendix F evaluates the benefits from the recreation opportunities created by the Dalton Reservoir project. The average annual equivalent amount would be $1,762,000. (See table 8-33, page III-8-130).

The Bureau of Sport Fisheries and Wildlife estimated the losses and gains in fishing and hunting opportunities which would occur with the installation of the Dalton Reservoir project. The summary of existing resources shows there was a need in 1964 for additional fishing resource to provide 160,627 additional man-days of fishing for Georgia Sub-region E, in which Dalton's prime economic area is located. These data further show that there would still be a need for an increase of fisheries resources in 1980 to provide for an unsatisfied demand of about 70,000 fishing man-days, assuming that the development of the Dalton Reservoir would have been completed. These data therefore indicate that the Dalton project is presently needed to provide fishing opportunities. Their report, which is part of Appendix G, shows a net annual benefit of $196,000 which would accrue from provision of the project.

Economic Expansion

Expansion benefits of two types, redevelopmental and developmental, would result from a new water resource project near Dalton. Predicated upon a study of unemployment and ease of travel for commuting workers and upon availability of data for small areas, the region of primary economic impact was established as consisting of five counties. (See exhibit 8-1.)

Only two of the counties have been designated as redevelopment areas in accord with Public Law 87-27, under which redevelopmental benefits are determined. But since the entire five-county area is within Appalachia, such determination would apply, under study criteria, to the entire impact area. Redevelopmental project benefits would be the cost of labor used in construction, operation, and maintenance of the works.

Developmental benefits are measured in terms of salaries and wages stemming from employment increases in the area. Included are only payments to persons not directly associated with the water resource project, but whose employment is directly attributable to the stimulating effect of the project upon the area's economy.

Costs

Costs for the dam, reservoir preparation, and recreation facilities used in analyzing alternative plans of development were taken from curves derived from preliminary layouts and quantity estimates and based on July 1967 price levels. Real estate costs were evaluated by field inspection and investigation of recent property sales in the area. The total acquisition costs include resettlement, severance damages, mineral rights, contingencies, and personnel costs.

Annual charges on the total investments were for an interest rate of 3-1/4 percent and amortization over 100 years. Annual operation and maintenance charges were generally based on recent experience at similar Corps of Engineers' projects. The charges relating to the recreation function of the projects were developed from Army Engineer District estimates of personnel and equipment required to provide adequate services to visiting recreationists. The annual cost of major replacements was based on the present worth, at a 3-1/4 percent discount, of their value.

The annual economic cost of eliminating the productivity of lands lost to the alternative projects has been taken as 5 percent of the land market value. This standard will require adjustment upward in future examination of project economics due to the recent increases in the private and Federal interest rates. The difference between this cost and the interest cost on the investment amount for lands is shown in the economic analyses as net loss of land productivity. Other types of income which would accrue from a project area in the absence of the project have been deducted from the expansion benefits credited to the project.

Alternate Reservoirs

In the preliminary phase of screening alternatives for meeting the Dalton area water-resource-connected needs, potential reservoir sites were selected from map studies and available data on sites considered

in detailed studies of the Oostanaula River watershed over the last 35 years. As a result, the range of development possibilities was narrowed to seven sites in the Conasauga River drainage basin. These were investigated in field trips by engineers and geologists to obtain up-to-date information on their attributes in general and, in particular, on the practicality of building engineering works there and potential project-connected problems concerning cultural and environmental values. In connection with environmental values, those archeological and historical sites readily identifiable were noted during field investigations. Comparisons of each reservoir site were made to determine the improvements in the area's environs through provisions of stream water quality improvement; additional fishing, hunting and general outdoor recreation improvement; and, the expansion of existing areas of historical or archeological interests. Storage capabilities and their relationships to structure sizes and project costs were developed in engineering studies. Where field reconnaissance and office analyses revealed obvious defects, such as unsuitable geologic conditions, excessive costs of relocations, or unfavorable cost-to-storage relationships, sites were eliminated from further consideration. The seven potential reservoirs and the drainage area they would control, together with the main reason for rejection where applicable at this stage of investigation, are listed in the following table.

TABLE 8-2

ANALYSIS OF MAJOR RESERVOIRS, FIRST SCREENING

Stream and site designation	Drainage area Controlled (sq. mi.)	Disposition	Reason for elimination
Conasauga River:			
Jacks River	86	Retained	
Lower Jacks R.	94	Eliminated	Nearby Jacks River site is more favorable.
Mitchell Bridge	252	Retained	
Coahulla Creek:			
Coahulla Creek	113	Retained	
Conasauga River:			
Dalton	624	Retained	
Lower Conasauga	649	Eliminated	Relocations at nearby Dalton site would cost less.
Coosawattee Riv.:			
Carters	376	Modification eliminated	Currently under construction. Flow diversion, loss of power revenue too costly.

Investigations concerning the inclusion of hydroelectric power development - both conventional and pumped-storage - in projects at the seven locations led to the conclusion that the Lower Jacks River site would be best for power generation, but respective benefits would be insufficient to justify such a project purpose.

Four reservoir sites were retained for further study as a result of this initial screening. These sites were (a) Dalton Reservoir on Conasauga River, (b) Coahulla Creek Reservoir on Coahulla Creek, (c) Mitchell Bridge Reservoir on Conasauga River, and (d) Jacks River Reservoir on Conasauga and Jacks Rivers. Their locations are shown on exhibit 8-2.

Data on these four sites were developed in greater detail. Some field surveys and borings were required. At each site, project cost estimates and evaluation of project benefits were made for three heights of dam in order to determine the scale of development that would provide maximum net annual benefits.

The capability of each alternative site and project scope to provide storage for water supply and quality control was investigated. If potential reservoir capacity was limited, provision of only municipal and industrial water supply storage for the Dalton growth center was

first considered. Where greater capacities were available, storage for water quality control was included to the extent allowed by the scope of a practicable site development after reserving needed water supply storage. Provision of reservoir storage to satisfy fully 2020 area needs for both water supply and water quality control was considered at sites with ample capacities. In addition, each studies project included storage not less than the volume of sediment expected to be deposited in it over 100 years. A storage-draft relationship for the Conasauga River at the Tilton gage was developed and used in estimating storage requirements to meet the identified needs. The graph representing this relationship is shown in exhibit 8-3.

Each alternative site has potential for water-based recreational development. Analyses of the recreational benefits are based on a moderate drawdown and are deemed sufficiently accurate for an evaluation of the relative merits of the considered developments.

In addition, multipurpose reservoir projects at any of the four sites would result in expansion benefits to the Dalton area and the Nation.

Table 8-3 shows the results of the analyses for the four reservoirs which were studied in detail. It presents physical and economic data for the scale of development which would provide maximum net benefits at each site, assuming no projects at the other three sites. The evaluation of annual benefits differs from that described in the preceding text - and used in subsequent project formulation studies - as follows:

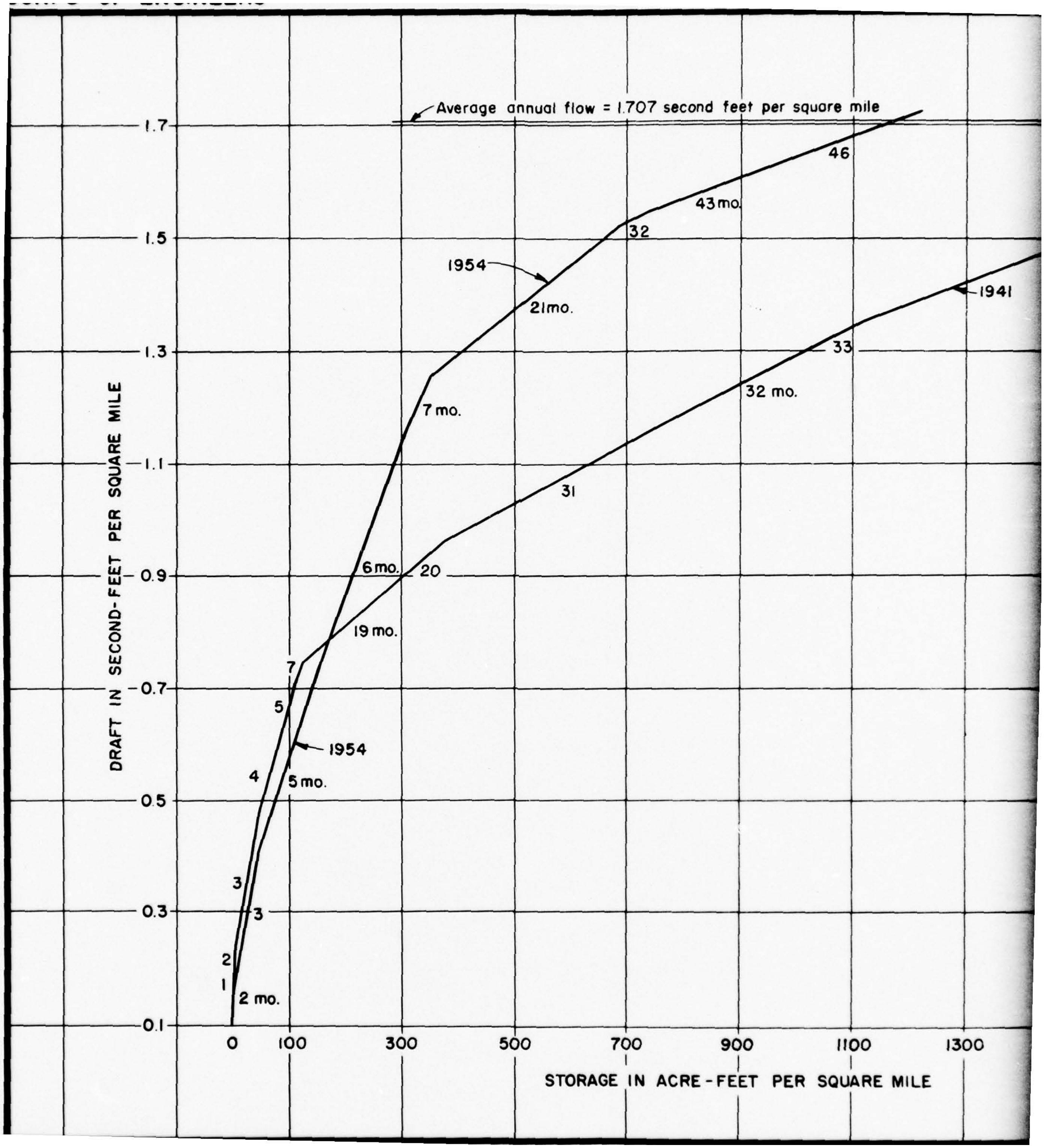
a. Types of income other than land productivity which would accrue in the various project areas in the absence of the projects have not been deducted from the respective potential expansion benefits.

b. The national redevelopmental benefits include amounts which should be transferred to the national developmental benefit category. As these differences are too minor to influence the final site selection, they were not eliminated.

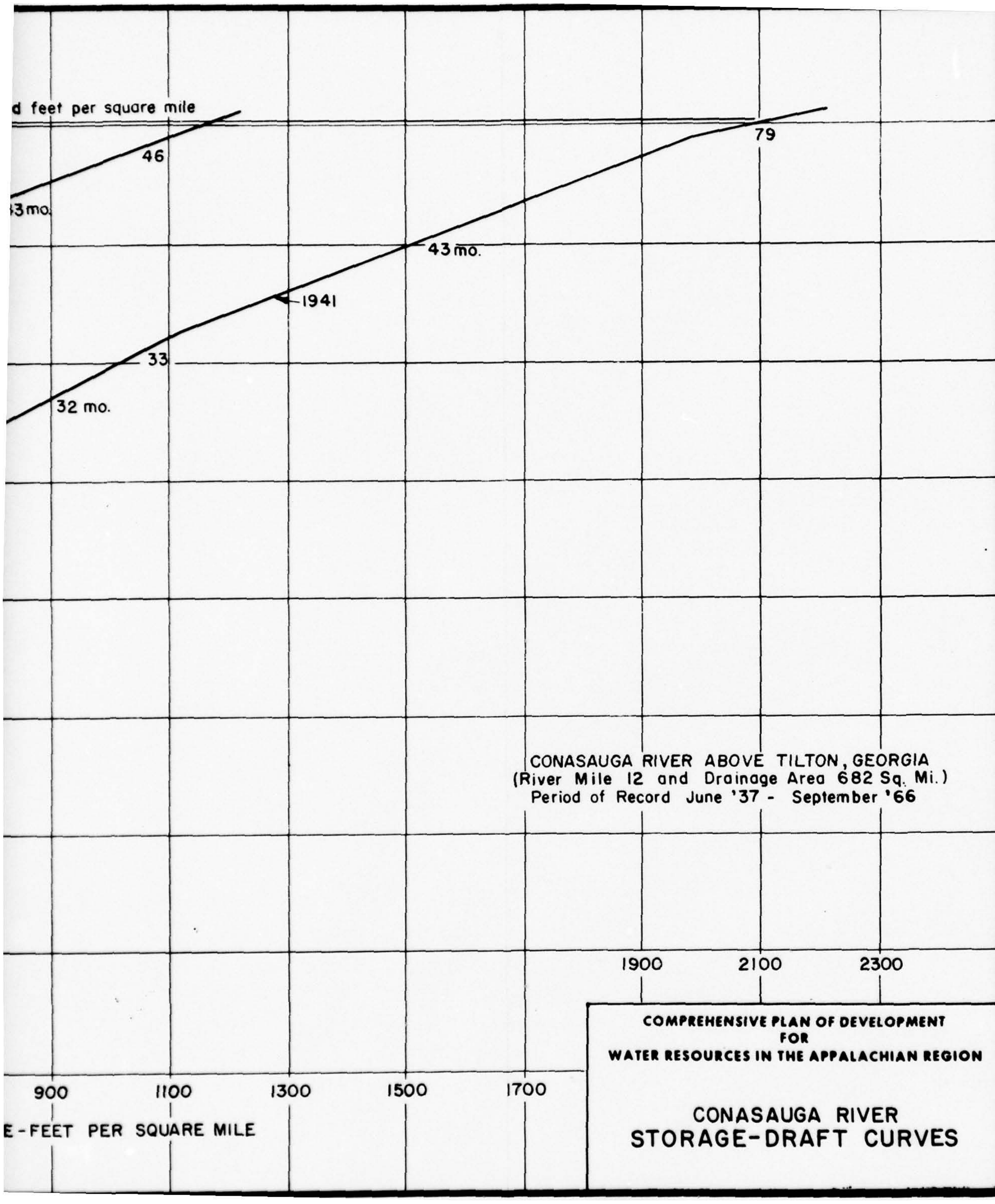
Table 8-3 indicates that the average annual net benefits would be relatively small from potential projects at the Jacks River and Coahulla Creek sites. Accordingly, these sites were eliminated from further consideration as a location for the first-priority project.

The net annual benefits from a multipurpose reservoir at Dalton would be greater than from a project at the Mitchell Bridge site.

Further, in comparing the merits of these two potential water resource development, the following differences between them should also be noted:



Average annual flow = 1.707 second feet per square mile
1954
1941
DRAFT IN SECOND-FEET PER SQUARE MILE
STORAGE IN ACRE-FEET PER SQUARE MILE
0.1
0.3
0.5
0.7
0.9
1.1
1.3
1.5
1.7
0
100
300
500
700
900
1100
1300
2 mo.
5 mo.
6 mo.
7 mo.
21mo.
32
43 mo.
46
19 mo.
20
31
32 mo.
33



COMPREHENSIVE PLAN OF DEVELOPMENT
FOR
WATER RESOURCES IN THE APPALACHIAN REGION

CONASAUGA RIVER
STORAGE-DRAFT CURVES

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TABLE 8-3
SUMMARY OF PRELIMINARY ECONOMIC ANALYSES OF MAJOR RESERVOIRS

	Dalton	Mitchell Bridge	Jacks River	Coahulla Creek
Physical data:				
Location:				
Stream	Conasauga R.	Conasauga R.	Conasauga R.	Coahulla Cr.
Damsite.........miles above rivermouth	24.8	41.2	74.4	7.0
Drainage area...............square miles	624	252	86	113
Type of dam	Conc.-earth	Conc.-earth	Conc.-earth	Earth
Type of spillway	Gated	Gated	Gated	Sidechannel
Maximum height of dam...............feet	75	66	200	63
Reservoir elevations:				
Top of dam..........feet above m.s.l.	699.5	742	1,132	731
Top of spillway gate.............do	690	731	1,121	716 1/
Maximum conservation pool.........do	680 2/	730	1,120	716
Minimum conservation pool.........do	664	692	984	684
Storage capacities:				
To top of spillway gate acre-feet/watershed-inches	220,000/6.6	225,000/16.7	154,000/33.6	52,000/8.6
Flood control.....................do	131,000/3.9 3/	(4/)	(4/)	(4/)
Conservation.....................do	85,600/2.6 5/	215,000/16.0	145,500/31.7	52,000/8.6
Sediment and inactive.............do	24,400/ .7	10,000/ .7	8,500/ 1.9	2,000/ .3
Reservoir surface areas:				
Maximum conservation pool........acres	8,650	10,700	1,740	3,300
Minimum conservation pool.........do	2,800	1,500	360	380
Dependable yield from storage -				
Below maximum reservoir pool....m.g.d.	350 6/	278 7/8/	95 7/9/	125 7/8/
Below maximum conservation pool...do	275	198	87	74
Growth center water needs by year 2020:				
Municipal and industrial supply...do	137	137	137	137
Added quality control flows.......do	121 10/	121	121	121
Economic data:				
Construction cost and investment:				
Lands and damages	8,700,000	6,392,000	567,000	2,312,000
Relocations and clearing	18,730,000	5,315,000	2,393,000	4,869,000
Dam and appurtenances	9,920,000	10,693,000	31,582,000	3,739,000
Recreation facilities	4,575,000	4,575,000	1,205,000	1,080,000
Subtotal	41,925,000	26,975,000	35,747,000	12,000,000
Interest during construction	2,568,000	1,845,000	2,323,000	563,000
Total	44,493,000	28,820,000	38,070,000	12,563,000
Average annual charges:				
Interest, 3-1/4 percent	1,446,000	937,000	1,237,000	393,000
Amortization over 100 years	61,000	40,000	53,000	19,000
Operation and maintenance	391,000	388,000	138,000	115,000
Major replacements	48,000	48,000	13,000	5,000
Net land productivity loss	65,000	69,000	29,000	26,000
Total	2,011,000	1,482,000	1,470,000	558,000
Average annual benefits:				
User benefits:				
Water supply	195,000	195,000	125,000	105,000
Water quality control	163,000	82,000	-	-
Flood control	443,000	-	-	-
Recreation	1,960,000	1,960,000	285,000	540,000
Total	2,761,000	2,237,000	410,000	645,000
Expansion benefits, national:				
Developmental	4,670,000	3,595,000	1,630,000	1,368,000
Redevelopmental	101,000	66,000	105,000	29,000
Total	4,771,000	3,661,000	1,735,000	1,397,000
Expansion benefits, regional:				
Developmental	165,197,000	127,201,000	57,653,000	48,403,000
Redevelopmental	444,000	289,000	460,000	127,000
Total	165,641,000	127,490,000	58,113,000	48,530,000
Total benefits:				
User	2,761,000	2,237,000	410,000	645,000
National	7,532,000	5,898,000	2,145,000	2,042,000
Regional	168,402,000	129,727,000	2,555,000	2,687,000
Net benefits:				
User	750,000	755,000	- 1,060,000	87,000
National	5,521,000	2,179,000	675,000	1,454,000
Regional	166,391,000	128,245,000	1,085,000	2,129,000

1/ Elevation of sidechannel spillway crest or storage to that elevation.
2/ Seasonal operation for water supply, water quality control, and recreation.
3/ Storage increment between elevations 687.5 and 671.5.
4/ Operation is for conservation only, with no dependable drawdown for flood control.
5/ Storage increment between elevations 680 and 664.
6/ *Based on 1941 low flow period and all storage* above minimum conservation pool, el. 664.
7/ Approximate yield based on average annual flow at site.
8/ Topography would not allow storage needed for all purposes; nor sufficient storage for only the water supply and quality control demand of 258 m.g.d. by 2020.
9/ Topography would allow storage to provide *maximum yield from watershed* runoff, but resources would not meet future demand for water supply and quality control.
10/ Based on yield from 11,400-acre-foot single-purpose storage at the Dalton site required to meet 2020 needs for additional streamflow.

a. The cost of the Dalton project would be greater, but that reservoir would control 624 square miles of drainage area versus 252 square miles for a reservoir at Mitchell Bridge. Control of the larger area would result in a significantly better utilization of runoff, which, in turn, would insure an adequate water supply for the projected municipal and industrial demand in the area and would also provide for a greater and more dependable yield for maintaining augmented low flows as needed. From the standpoint of environmental improvement, this capability was more favorable at the selected site than at any other investigated. In addition, the Dalton Reservoir's capacity would allow a future reallocation of storage among project purposes if water supply demand in the latter half of the project life should exceed the estimates for the 50-year study period.

b. The Mitchell Bridge site does not have the capacity for meeting fully both water supply and water quality control requirements identified to the year 2020. As an added drawback, with the site developed primarily for these two most important water-related area needs, local topography would allow no inclusion of flood control storage in the project.

c. Less land area suitable for agricultural use would be included in the Dalton Reservoir than in the Mitchell Bridge Reservoir. While this is reflected in the respective estimates of cost, the analysis does not disclose the potential disruptive effect that the removal of the greater area of arable land would have on the local economy.

The above-discussed analyses clearly indicated that a multiple-purpose reservoir at the Dalton site was the best solution for the immediate and projected needs in the Dalton-Rome growth area, in Water Sub-region E. Subsequent studies were therefore limited to the determination of the optimum development of the Dalton Reservoir project.

Exhibit 8-4 depicts the storage required to meet the growing needs to 2020 for municipal and industrial water supply and augmented streamflow in the Dalton area. Analyses made for various heights of a potential dam indicated that benefits increased with the volume of storage reserved for these purposes. (See exhibits 8-5 and 8-6.) Scales of development considered for maximizing benefits from a water resource project at Dalton are presented in table 8-4. The study showed that urban developments near the reservoir area, i.e., the municipal airport, industrial plants, and residences which would be inundated by a high pool, limit the highest practicable reservoir surface elevation to about 695 feet above mean sea level; also, that net benefits would be maximized with a reservoir which, besides meeting the 2020 needs for water supply and augmented streamflows, would include storage for 1 inch of watershed flood runoff and a recreation pool at elevation 684 feet above mean sea level. The seasonal conservation storage would be between the recreation pool elevation and the normal winter pool elevation at 681.5 feet. The reservoir's floodwater storage capacity would lie between elevations 681.5 and 685. Also, the modification of Plan No. 3, to reallocate one inch of flood control storage to conservation uses, would result in an increase in recreation user benefits and a decrease in flood control benefits for a net benefit gain of about $60,000. Expansion benefits would not change since they are predicated primarily on the basis of sufficient water for municipal and industrial uses including quality control. This provision for additional conservation storage was determined to exceed expected future requirements and benefits could not be developed therefrom. Any compensation for flood storage losses in the surcharge plan could not be assigned a user benefit. Should future water use needs exceed those estimated, Plan No. 1 (Selected) is sufficiently flexible to allow for the reallocation of storage for up to 350 mgd yield which exceeds estimated future requirements by about 90 mgd.

However, it was considered sound judgment to increase the storage for floodflows and thus provide better protection to lands suitable for locating industry near the urban center. Some industrial development has already occurred in the Whitfield Industrial District, on the right bank of the Conasauga River, where a Dow Chemical Corporation plant was recently located 14 miles below the proposed dam. The selected reallocation of potential reservoir capacity provides for storing nearly 4 inches of winter flood runoff from the watershed. The temporary retention of floodwaters from December through March, when the greatest floods of record have occurred, would be in the reservoir space between elevations 671.5 and 687.5, where volumes of up to 33 percent of the standard project flood could be stored. Real estate acquisition would allow for an induced surcharge storage of 82,000 acre-feet, or 2.5 inches of runoff over the drainage area, above elevation 687.5 to elevation 693. The maximum pool elevation during the main recreation season,

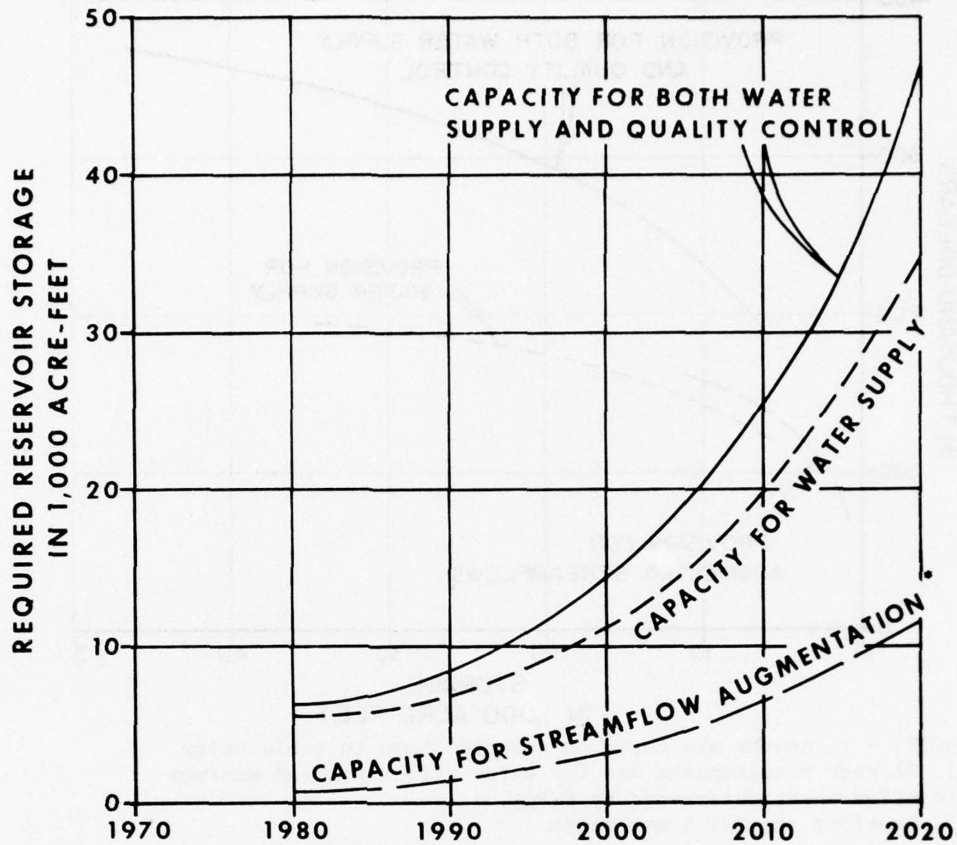
May through October, would be at 680 feet. This, in turn, would increase substantially the project's potential for storing occasional summer floodflows, thus enhancing the year-round degree of protection for downstream developments.

The selected allocation of reservoir capacity to the various purposes would insure meeting the projected water supply demand and the flow requirements for stream quality control over the 50-year study period. A volume of about 56,000 acre-feet would be stored for these purposes in the space available from April through November between elevations 671.5 and 680. With a space of 24,400 acre-feet set aside for sediment retention, an additional volume of 30,600 acre-feet would be available at all times under pool elevation 671.5.

Prior to its final selection, the reservoir with the recommended storage allocation was operated through the period of streamflow record at Tilton (1937-66) to determine its capability and dependability of meeting the 680-foot pool level during the summer while providing for other water use needs. The results are shown in exhibit 8-7. It was found that a seasonal recreational pool could be maintained at elevation 680 about 45 percent of the time; also, that about 95 percent of the time, the pool would be within the range between elevations 675 and 680. Based on studies of other projects in the Appalachian area, it is concluded that recreation benefits would not be significantly reduced by this frequency of 5-foot drawdowns. The relationship between seasonal pool elevations and the percentage of time they are attained or exceeded is presented in exhibit 8-8.

Since satisfaction of the Dalton growth center's water use needs is paramount in achieving the developmental growth objective it was considered advisable to impose a more severe test on the reservoir's capability to store needed volumes than that of the most severe drought recorded at the Tilton gage. The drought period, its adaptation to the Dalton Reservoir drainage area, the results of reservoir operation to meet the needs during this period, and conclusions based thereon are presented in the <u>Water Supply and Water Quality Control</u> subparagraph of paragraph 10.

The project as planned and discussed in the preceding paragraphs is deemed the most practicable for meeting the combination of water resource needs in the Dalton area. Fitting the flood control, water supply, streamflow augmentation, and sedimentation storages below elevation 695 was prerequisite to precluding an inundation of existing urban development in the area. A more detailed study of water use storage requirements with a view towards providing a 100-percent dependability under 1904 drought conditions, as well as refinements in storage capacity allocation based on field surveys, will be made during preconstruction planning for the project.



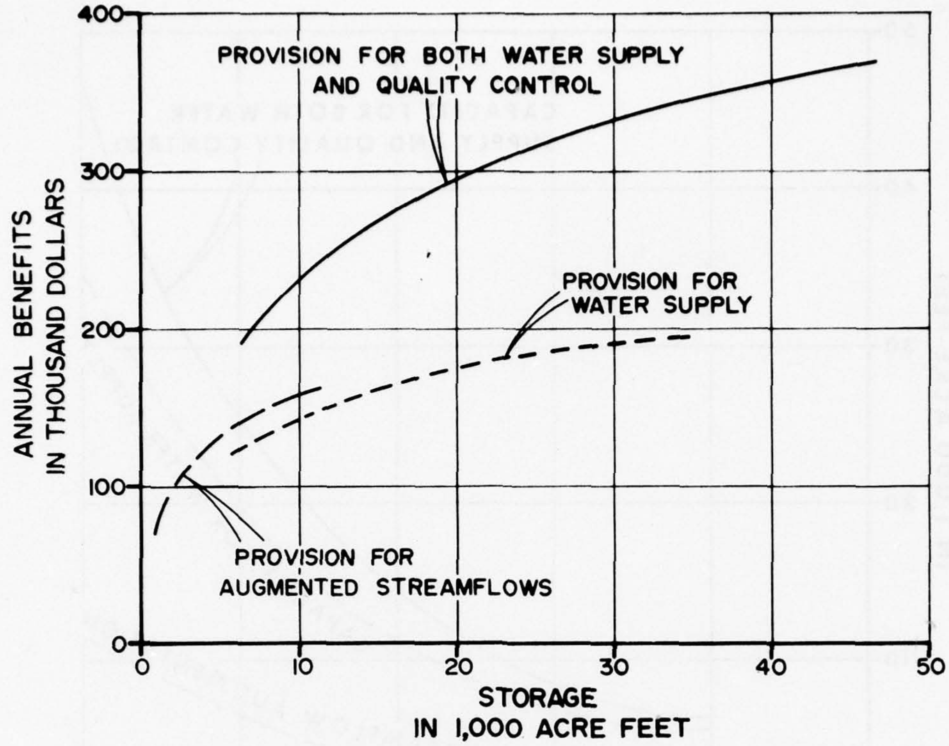
*BASED ON PRIOR, 85-PERCENT REMOVAL OF BOD FROM EFFLUENT

COMPREHENSIVE PLAN OF DEVELOPMENT
FOR
WATER RESOURCES IN THE APPALACHIAN REGION

DALTON RESERVOIR, GEORGIA

STORAGE REQUIRED TO MEET GROWING NEEDS
for
MUNICIPAL AND INDUSTRIAL WATER SUPPLY
and
AUGMENTED STREAMFLOW FOR WATER QUALITY CONTROL

EXHIBIT 8-4



NOTE. - 1. Graphs are based on amounts shown in table below.
2. Storage requirements are for water withdrawal and minimum streamflow needs determined by FWPCA.
3. Benefits are FWPCA estimates.

STORAGE AND BENEFIT AMOUNTS FOR SELECTED YEARS

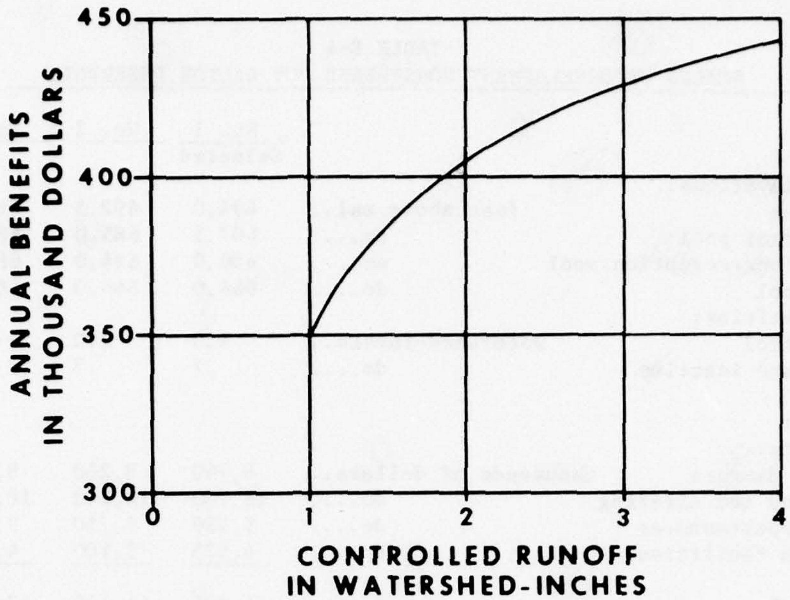
	Reservoir storage required in 1,000 acre-feet			Benefit from provisions for needs in 1,000 dollars		
	Purpose			Purpose		
By year	Water supply	Water quality	Total	Water supply	Water quality	Total
1980	5.6	0.8	6.4	120	70	190
2000	11.2	3.2	14.4	148	115	263
2020	34.9	11.7	46.6	195	163	358

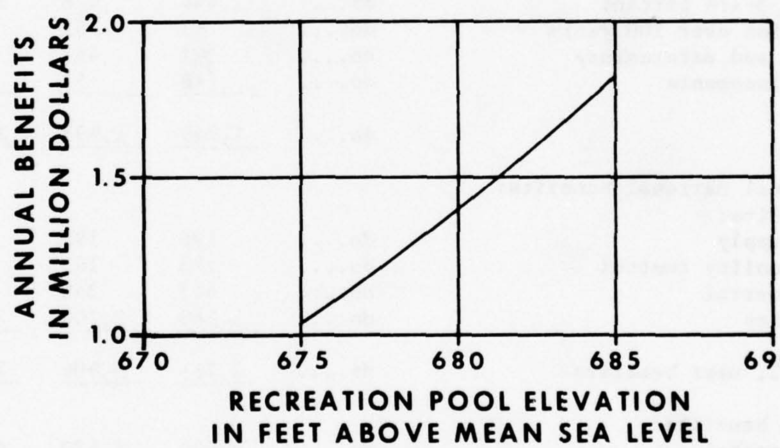
COMPREHENSIVE PLAN OF DEVELOPMENT FOR WATER RESOURCES IN THE APPALACHIAN REGION

DALTON RESERVOIR, GEORGIA

USER BENEFITS vs. VOLUME OF STORAGE for WATER SUPPLY and QUALITY CONTROL

EXHIBIT 8-5





COMPREHENSIVE PLAN OF DEVELOPMENT
FOR
WATER RESOURCES IN THE APPALACHIAN REGION

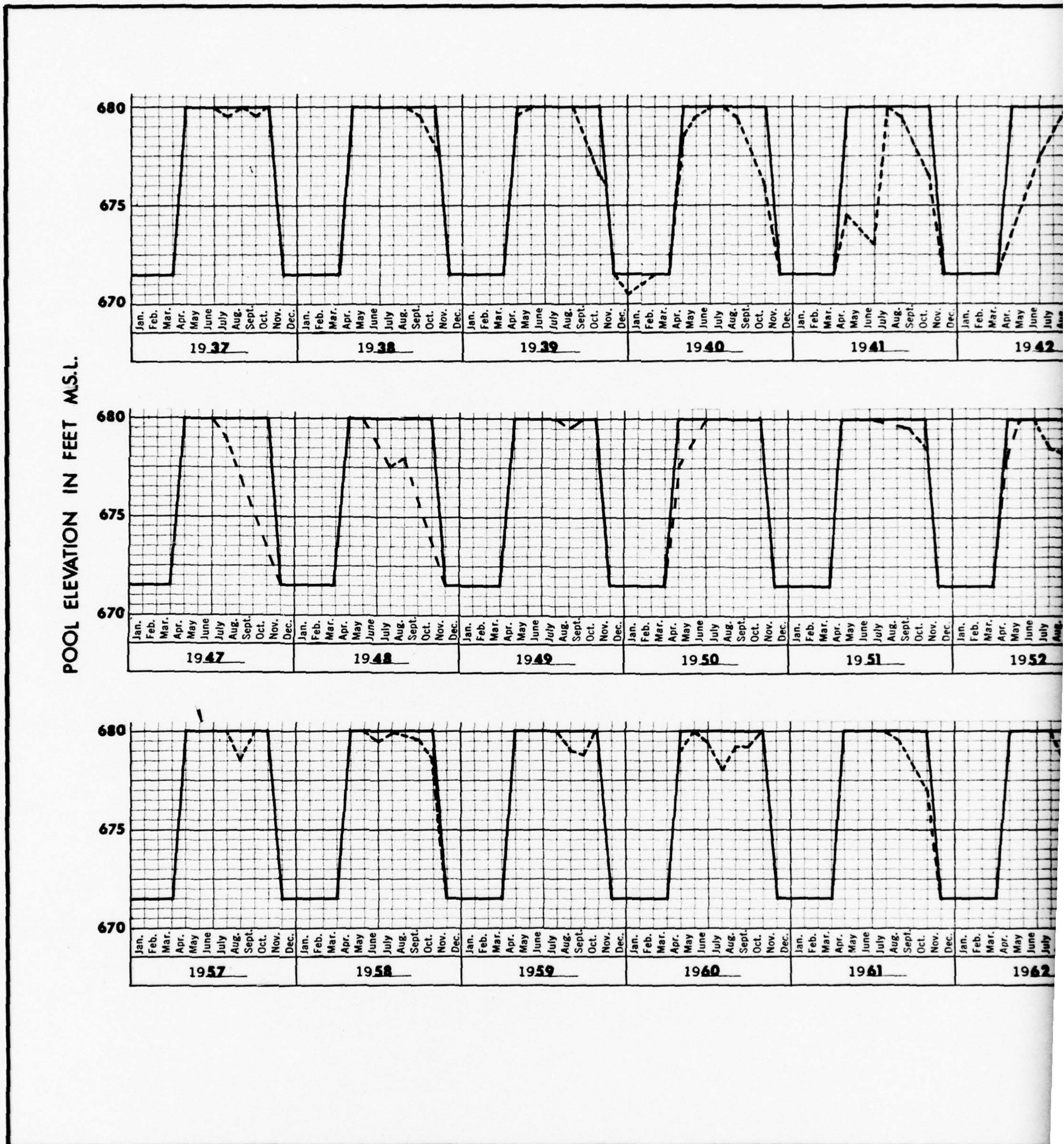
DALTON RESERVOIR, GEORGIA

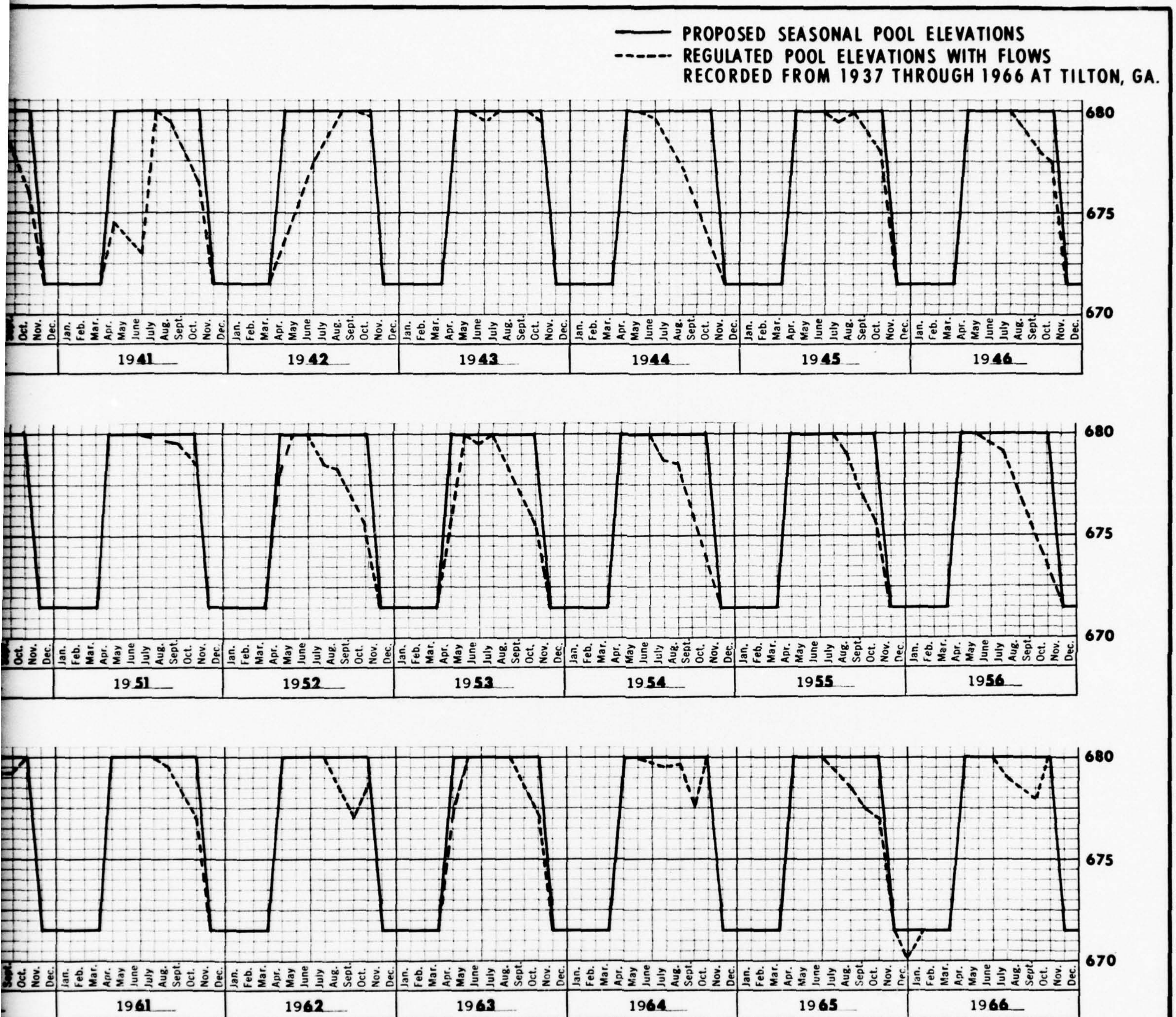
USER BENEFITS
vs.
VOLUME OF CONTROLLED RUNOFF
and
ELEVATION OF RECREATION POOL

EXHIBIT 8-6

TABLE 8-4
SCALES OF DEVELOPMENT CONSIDERED FOR DALTON RESERVOIR

		No. 1 Selected	No. 2	No. 3	No. 4
Physical data:					
Reservoir elevations:					
Taking line	feet above msl..	694.0	692.5	694.0	698.0
Flood control pool	do....	687.5	685.0	687.5	693.0
Conservation/recreation pool	do....	680.0	684.0	683.0	685.0
Minimum pool	do....	664.0	664.0	664.0	664.0
Storage capacities:					
Flood control	watershed-inches..	4.0	1.0	2.0	4.0
Sediment and inactive	do....	.7	.7	.7	.7
Economic data:					
Project costs:					
Lands and damages	thousands of dollars..	8,700	8,260	8,550	50,780
Relocations and clearing	do....	18,730	18,240	18,741	19,828
Dam and appurtenances	do....	9,920	9,750	9,829	10,072
Recreation facilities	do....	4,575	5,180	4,970	5,395
Subtotal	do....	41,925	41,430	42,090	86,075
Interest during construction	do....	2,568	2,509	2,572	5,401
Total	do....	44,493	43,939	44,662	91,476
Average annual charges:					
Interest, 3-1/4 percent	do....	1,446	1,428	1,452	2,973
Amortization over 100 years	do....	61	61	62	126
Operation and maintenance	do....	391	451	435	468
Major replacements	do....	48	53	52	55
Total	do....	1,946	1,993	2,001	3,622
Average annual national benefits:					
User benefits:					
Water supply	do....	195	195	195	195
Water quality control	do....	163	163	163	163
Flood control	do....	443	348	404	443
Recreation	do....	1,960	2,200	2,080	2,310
Total, user benefits	do....	2,761	2,906	2,842	3,111
Expansion benefits:					
Developmental	do....	4,670	4,670	4,670	4,670
Redevelopmental	do....	101	103	103	109
Total, expansion benefits	do....	4,771	4,773	4,773	4,779
Grand total	do....	7,532	7,679	7,615	7,890
Net user benefits	do....	815	913	841	- 511
Net national benefits	do....	5,031	5,061	5,021	3,615


POOL ELEVATION IN FEET M.S.L.
680
675
670
Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.
1937
1938
1939
1940
1941
1942
1947
1948
1949
1950
1951
1952
1957
1958
1959
1960
1961
1962



COMPREHENSIVE PLAN OF DEVELOPMENT FOR WATER RESOURCES IN THE APPALACHIAN REGION

DALTON RESERVOIR, GEORGIA

MONTHLY REGULATION FOR 2020 WATER DEMAND

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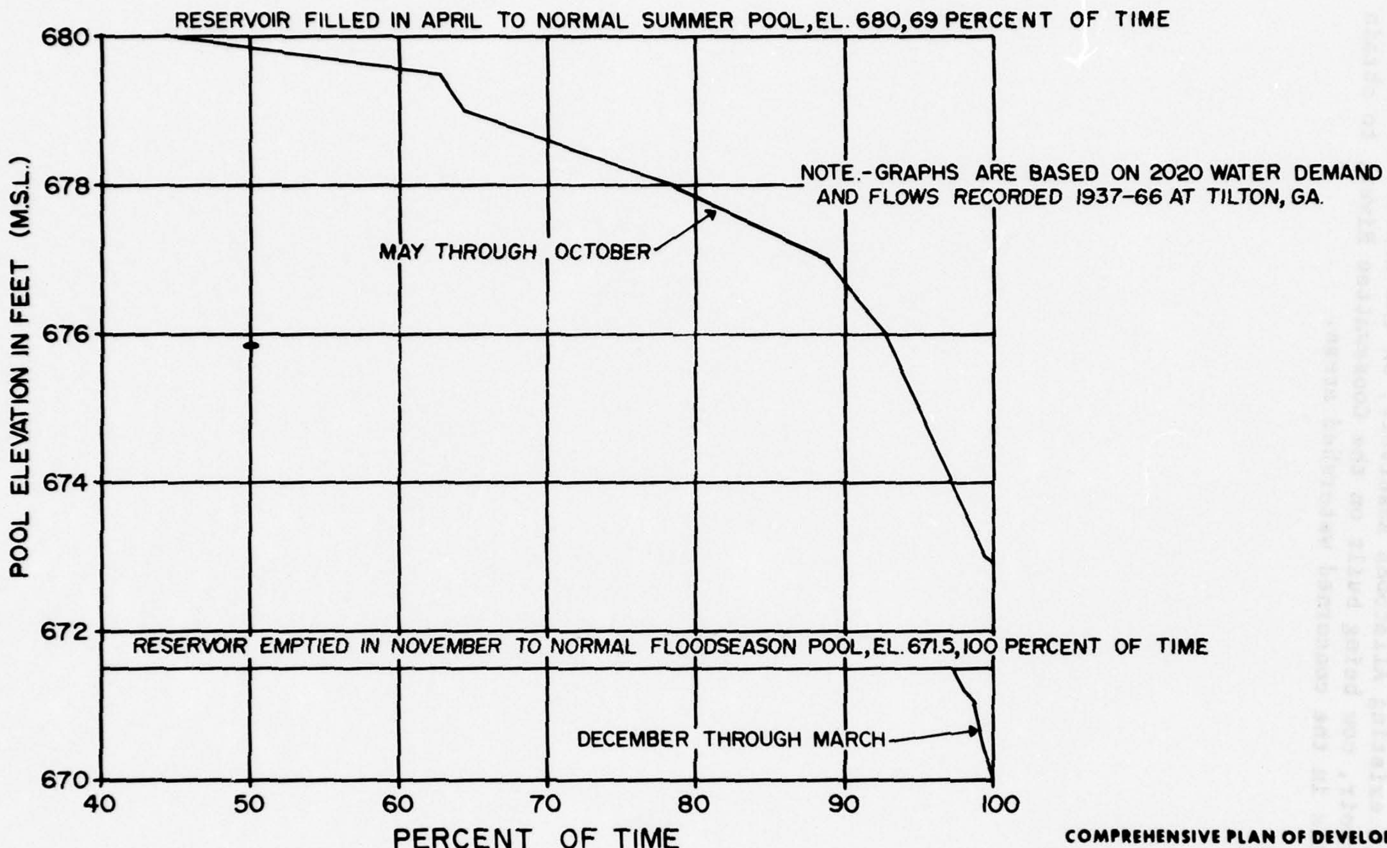


COMPREHENSIVE PLAN OF DEVELOPMENT
FOR
WATER RESOURCES IN THE APPALACHIAN REGION

DALTON RESERVOIR, GEORGIA

SEASONAL POOL ELEVATIONS
VS.
PERCENTAGE OF TIME
THEY ARE ATTAINED OR EXCEEDED

EXHIBIT 8-8

Dalton Reservoir would become part of a system for controlling flooding and stream water quality at downstream points. When the reservoir is installed, a plan will be determined for an integrated systems operation with existing Allatoona Reservoir, on the Etowah River, and Carters Reservoir, now being built on the Coosawattee River, to obtain optimal results in the concerned watershed areas.

9. SELECTED PROJECT

Stream profiles of the Conasauga and Oostanaula Rivers are shown in exhibit 8-9. The Dalton Reservoir area is presented in exhibit 8-10. The impoundment would be 18 miles long and have a surface area of 8,650 acres at the level of the maximum conservation (summer recreation) pool. The dam would consist of a gated spillway structure flanked by concrete nonoverflow sections, with these, in turn, tied to high ground by earthfill sections. A layout of Dalton Dam is given in exhibit 8-11.

The project would provide for the area's critical water supply and flow augmentation needs. Besides, it would serve flood control, general outdoor recreation, and sediment retention, as well as regional redevelopment and development.

The water supply and stream quality control needs projected to 2020 for the Dalton area would be met fully. This, in turn, would support the potential expansion forecast for this center of economic growth.

Flood damages would be significantly reduced along the river system. The reduction would be 90 percent along the Conasauga River and 36 percent along the upper Oostanaula River. Percentages for reaches farther downstream would be smaller, diminishing with increasing distances from the dam, but the project's beneficial effect would extend to Rome, at the head of Coosa River. However, to sustain the flood control benefits afforded by the reservoir and to utilize fully the damage reduction potential of the project, a complementary flood plain management program is absolutely necessary for the related stream valleys. This is also essential for a future undisturbed growth in the area.

Integration of Dalton Reservoir in the systems operation of the Coosa River headwaters reservoirs would help maximize benefits from flow regulations by all reservoirs in the Alabama-Coosa River Basin.

The project would offer opportunities for meeting a prime portion of future general outdoor recreation needs in the region.

Reservoir space would be provided for retaining all sediment volumes estimated for the 100-year project life.

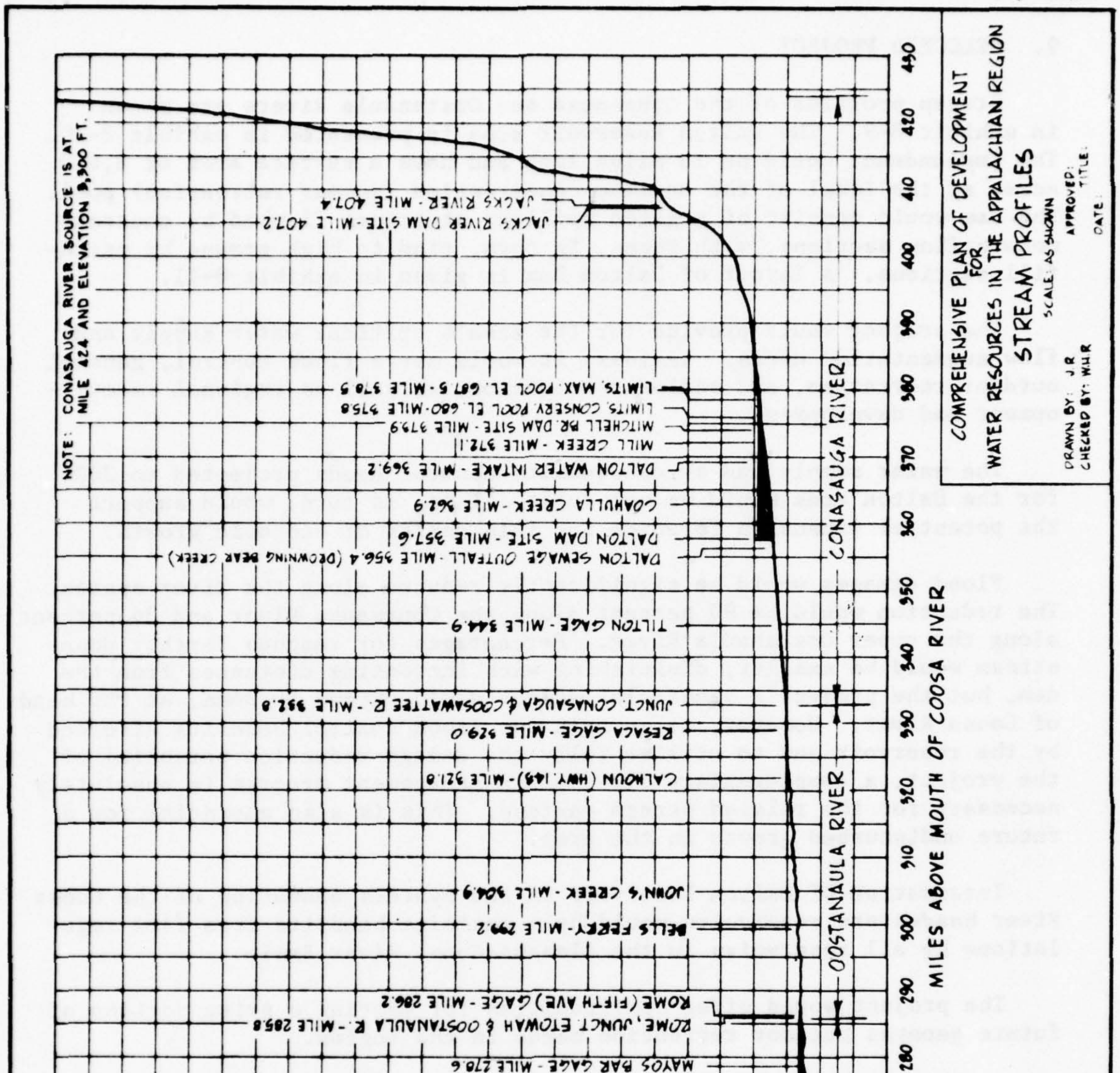
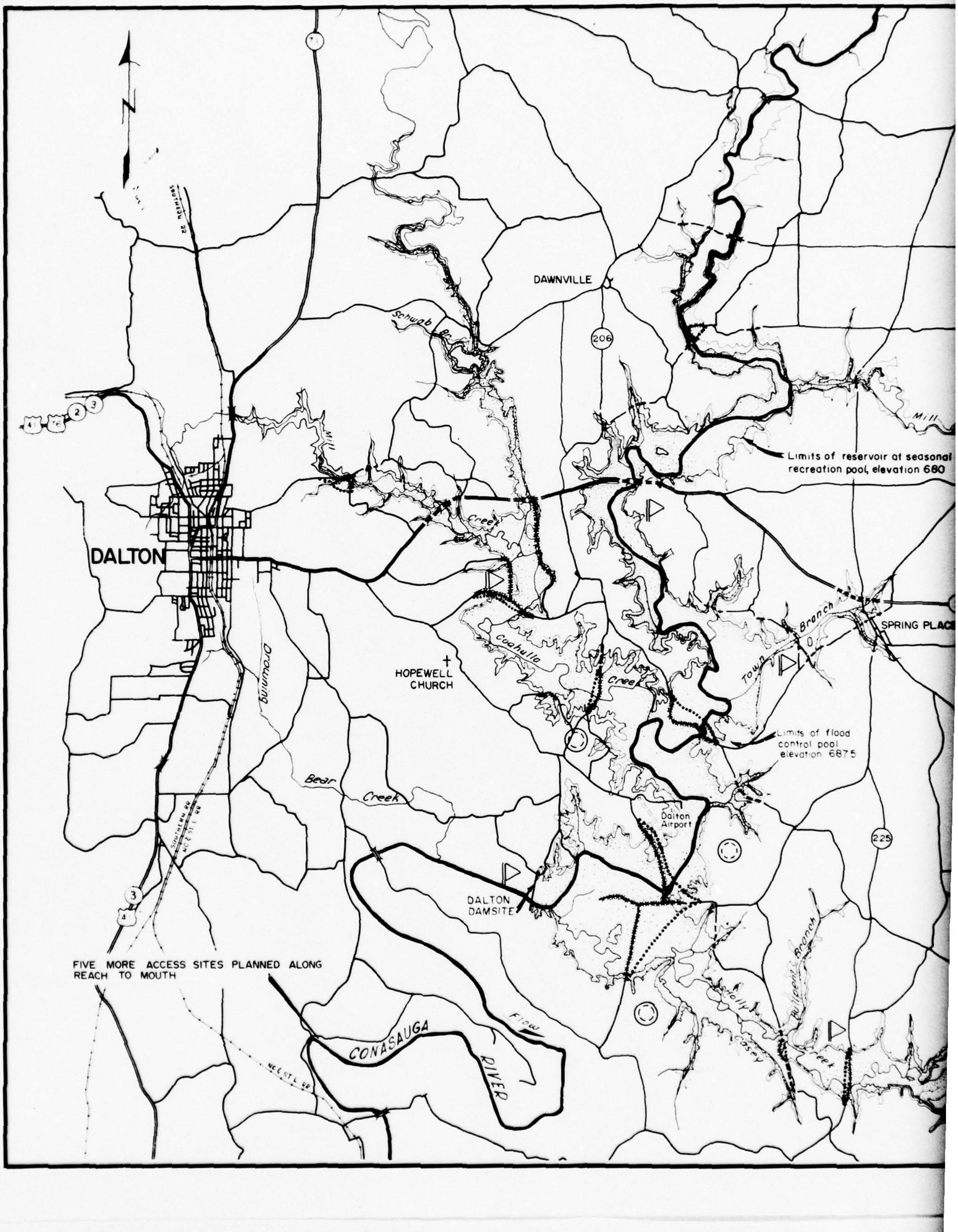

NOTE: CONASAUGA RIVER SOURCE IS AT MILE 424 AND ELEVATION 3,300 FT.
JACKS RIVER - MILE 407.4
JACKS RIVER DAM SITE - MILE 407.2
LIMITS, MAX. POOL EL. 687.5 - MILE 378.5
LIMITS, CONSERV. POOL EL. 680 - MILE 375.8
MITCHELL BR. DAM SITE - MILE 373.9
MILL CREEK - MILE 372.1
DALTON WATER INTAKE - MILE 369.2
COAHULLA CREEK - MILE 362.9
DALTON DAM SITE - MILE 357.6
DALTON SEWAGE OUTFALL - MILE 356.4 (DROWNING BEAR CREEK)
TILTON GAGE - MILE 344.9
JUNCT. CONASAUGA & COOSAWATTEE R. - MILE 332.8
RESACA GAGE - MILE 329.0
CALHOUN (HWY. 149) - MILE 321.0
JOHN'S CREEK - MILE 304.9
BELLS FERRY - MILE 299.2
ROME (FIFTH AVE) GAGE - MILE 286.2
ROME, JUNCT. ETOWAH & OOSTANAULA R. - MILE 285.8
MAYOS BAR GAGE - MILE 270.6
WEISS RESERVOIR (EXIST.)
COOSA RIVER
OOSTANAULA RIVER
CONASAUGA RIVER
MILES ABOVE MOUTH OF COOSA RIVER
ELEVATION IN FEET ABOVE M.S.L.
COMPREHENSIVE PLAN OF DEVELOPMENT FOR WATER RESOURCES IN THE APPALACHIAN REGION
STREAM PROFILES
SCALE: AS SHOWN
DRAWN BY: J.R.
CHECKED BY: W.H.R.
APPROVED:
TITLE:
DATE:

EXHIBIT 8-9



DAWNVILLE
Schwab Br.
206
DALTON
Mill
Creek
Limits of reservoir at seasonal recreation pool, elevation 680
Mill
Coahulla
Creek
HOPEWELL CHURCH
Drowning
Town Branch
SPRING PLAC
Limits of flood control pool elevation 687.5
Bear Creek
Dalton Airport
225
DALTON DAMSITE
FIVE MORE ACCESS SITES PLANNED ALONG REACH TO MOUTH
Holly
Casey
Bullpen Branch
Creek
Flow
CONASAUGA
RIVER

2

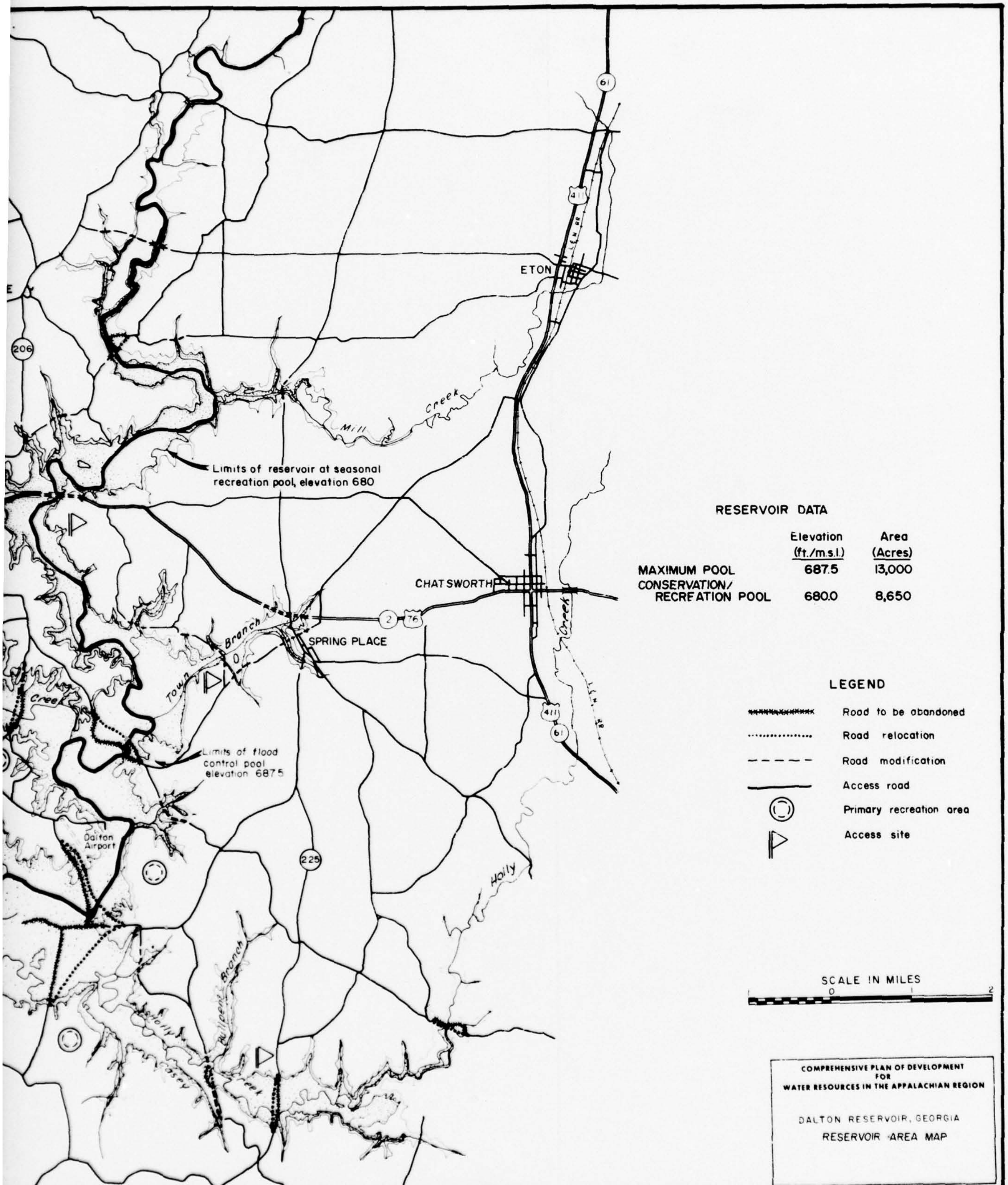


 EXHIBIT 8-10

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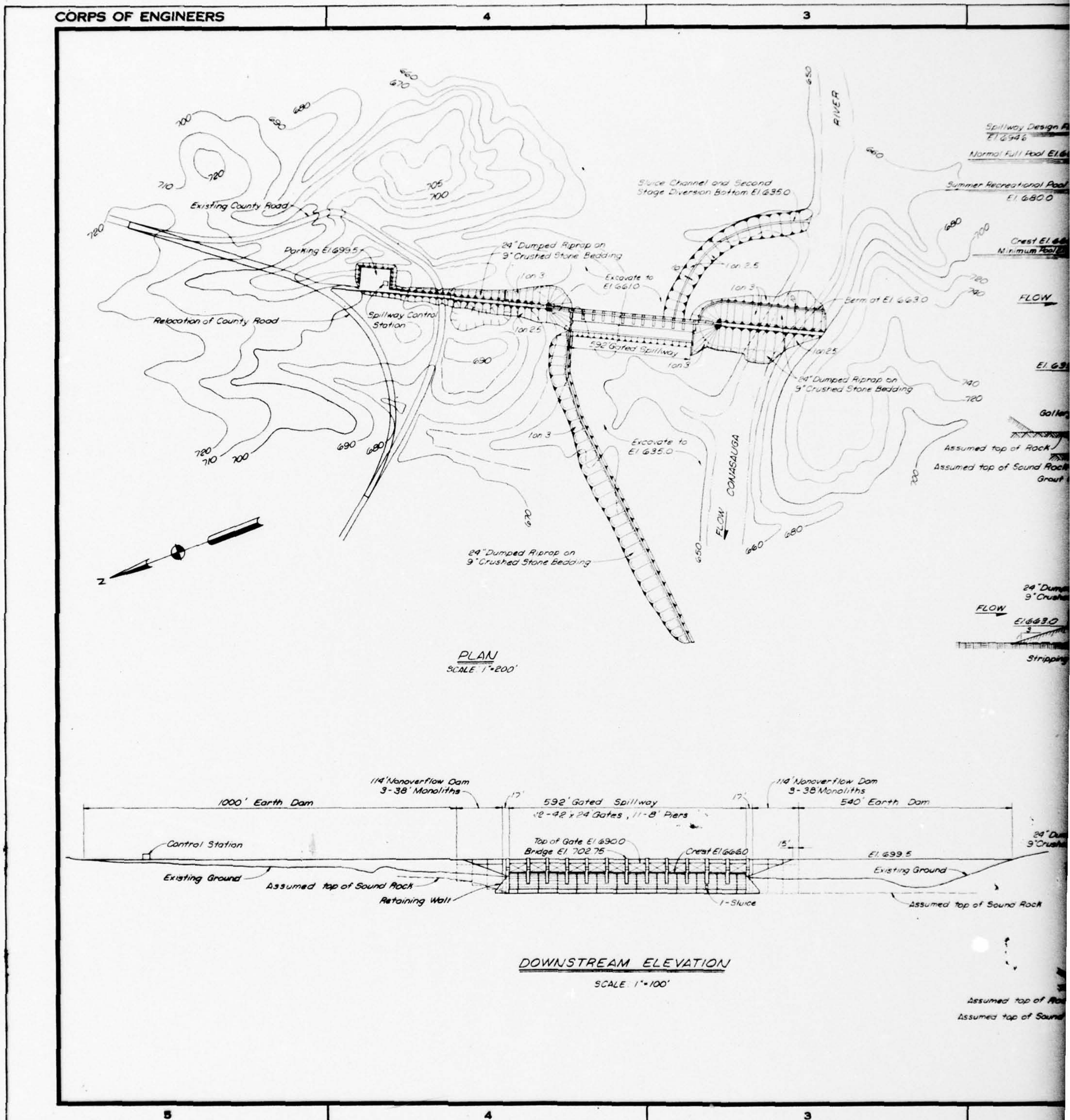

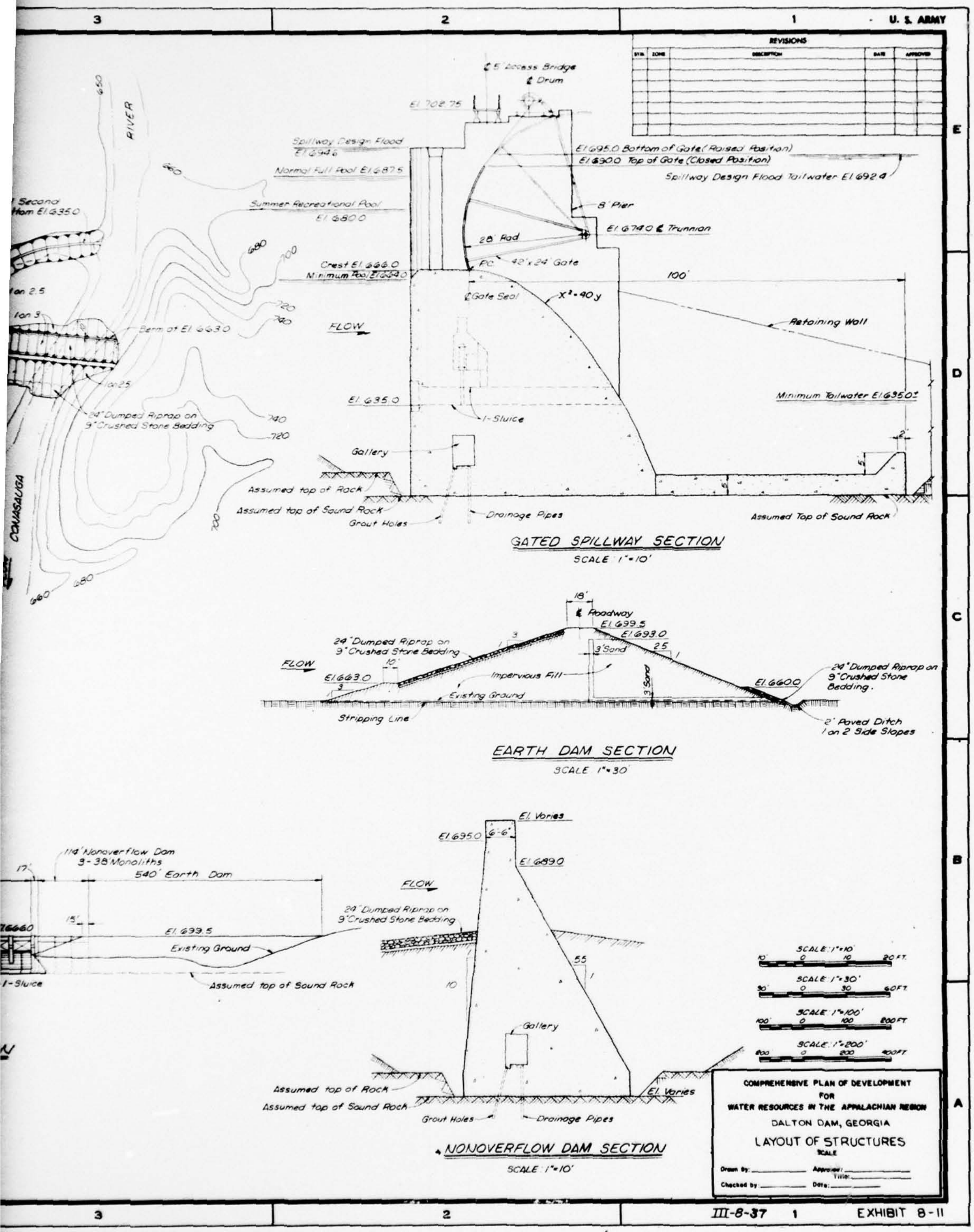
U. S. ARMY
REVISIONS
GATED SPILLWAY SECTION
SCALE 1"=10'
Spillway Design Flood
Normal Full Pool El. 687.5
Summer Recreational Pool El. 680.0
Crest El. 666.0
El. 695.0 Bottom of Gate (Raised Position)
El. 690.0 Top of Gate (Closed Position)
Spillway Design Flood Tailwater El. 692.4
8' Pier
El. 674.0 ℄ Trunnion
28' Rad
42'x24' Gate
℄ Gate Seal
$x^2 = 40y$
Retaining Wall
Minimum Tailwater El. 635.0±
FLOW
El. 635.0
1-Sluice
Gallery
Assumed top of Rock
Assumed top of Sound Rock
Grout Holes
Drainage Pipes
Assumed Top of Sound Rock
EARTH DAM SECTION
SCALE 1"=30'
℄ Roadway
El. 699.5
El. 693.0
24" Dumped Riprap on 9" Crushed Stone Bedding
Impervious Fill
Existing Ground
Stripping Line
El. 663.0
El. 660.0
2' Paved Ditch 1 on 2 Side Slopes
NONOVERFLOW DAM SECTION
SCALE 1"=10'
El. Varies
El. 695.0
El. 689.0
114' Nonoverflow Dam 3-38' Monoliths
540' Earth Dam
Existing Ground
Assumed top of Sound Rock
1-Sluice
RIVER
CONASAUGA
SCALE: 1"=10'
SCALE: 1"=30'
SCALE: 1"=100'
SCALE: 1"=200'
COMPREHENSIVE PLAN OF DEVELOPMENT FOR WATER RESOURCES IN THE APPALACHIAN REGION
DALTON DAM, GEORGIA
LAYOUT OF STRUCTURES
III-8-37
EXHIBIT 8-11

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SECTION III - DESIGN CONSIDERATIONS

10. HYDROLOGIC

Hydrologic analyses were made to determine the storage allocations needed in Dalton Reservoir to accomplish the proposed project purposes and to establish the hydraulic design of the structure. These analyses included evaluations of available hydrologic records and preparation of hypothetical floods used for structural design. A brief description of hydrologic characteristics of the project area and design data for the dam and reservoir follow.

General Climatology

Climatological and meteorological data were obtained from stations maintained and operated by the Weather Bureau of the Environmental Science Services Administration and are available in their publications.

The climate is temperate and moist, characterized by long, warm summers and short, usually mild winters. Freezing temperatures are common but are generally of short duration.

Climatological Records

There are several stations near the Dalton Reservoir site with 20 or more years of record. Three of these stations were selected as a basis for design, and their records are summarized in the following table.

TABLE 8-5
CLIMATOLOGICAL DATA FOR SELECTED STATIONS

Station	Elevation (feet msl)	Record began (year)	Average annual values: Temp. (° F.)	Precip. (in.)	Snowfall (in.)	Maximum 24-hour precip. (in.)
Dalton, Ga.	720	1935	60.6	54.64	NA	NA
Chattanooga, Tenn.	665	1875	61.2	51.96	3.8	5.40
Copperhill, Tenn.	1,537	1914	57.4	55.88	3.9	NA

NA - Not available

Temperature

The project lies within the temperate zone, experiencing warm summers and mild winters. Extreme temperatures recorded at the listed stations are -12° F. at Copperhill, Tenn., and 106° F. at Chattanooga, Tenn. The mean annual temperature is 60° F.

Precipitation

The average annual precipitation over the Conasauga River watershed is about 54 inches, and it is reasonably well distributed throughout the year.

Snowfall

Snowfall amounts in the project area vary from about 1 inch per year in the valleys to about 4 inches or more along the ridges. Snow accumulation is of little or no consequence to the runoff regimen of streams.

Storms

The region is subject to flood-producing storms during all seasons of the year; however, the frequency and severity of storms is significantly greater in the months from December through March.

Types of Storms

The sustained winter storms are normally of the frontal type and produce the larger floods in the area, particularly along the main streams. Although not as intense as the convectional-type storm these storms are of longer duration, often cover a large area, and, due to the orographic configuration of the region, result in flood conditions which are accentuated along the main watercourse. Summer thunderstorms of generally high intensities occur over small areas, frequently producing serious local flooding. Infrequent hurricane storms, their intensities usually diminished by the time they reach the project area, also bring about some summer flooding. With normal runoff conditions, from 5 to 6 inches of intense and general rainfall are required to produce widespread flooding, but on many of the minor tributaries, 3 to 4 inches could cause local floods.

Major Storms

The three most recent storms which occurred over the area and produced widespread flooding were those of November 1948, March 1951, and December 1961. All three were frontal-type storms, with heavy influx of warm, moist air from the Gulf of Mexico. The March 1951 storm occasioned the maximum flood of record on the Conasauga River. The storm also caused the highest stages on the Coosawattee River since the recorded maximum in April 1886.

Initial Losses, Infiltration, and Unit Hydrographs

The great distances between rainfall stations make a precise determination of the average rainfall over an area very difficult. Also, initial losses and infiltration capacities vary widely over a watershed depending on local topography, the season, antecedent conditions, vegetative cover, and soil. Yet, evaluation of these factors are basic to

design of a reservoir project. Studies for Dalton Reservoir indicate for the related area initial losses of 0.3 to 0.7 inch and infiltration losses of 0.03 to 0.08 inch per hour. Exhibit 8-12 summarizes the derivation of a unit hydrograph for Conasauga River at Tilton and includes information on losses experienced in the related watershed. A conservative value of no initial loss and 0.05 inch per hour infiltration capacity was applied to the rainfall increments of the design storms.

Runoff

Runoff throughout the region varies from 10.15 to 34.21 inches annually. At Tilton, the average runoff of the Conasauga River is 23.21 inches, or about 43 percent of the average annual rainfall. Annual runoffs and maximum floods at gaging stations used in design of the Dalton Reservoir project are shown in table 8-6, and the station's locations are shown in exhibit 8-1.

TABLE 8-6
RUNOFF AND FLOOD DATA

Stream and station	Drainage area (sq. miles)	Years of record	Annual runoff Mean (in.)	Annual runoff Max. (in.)	Annual runoff Min. (in.)	Gage datum (feet msl)	Maximum flood Stage (ft.)	Maximum flood Discharge (cfs)
Conasauga R.:								
Tilton	682	29	23.21	34.21	10.15	622.28	30.2	29,000
Oostanaula R.:								
Resaca	1,610	75	23.35	40.22	10.74	604.14	34.6	54,800
Rome	2,120	28	22.53	34.58	10.42	561.70	35.1	47,000

Stream Characteristics

The Conasauga River joins the Coosawattee River to form the Oostanaula River about 12 miles downstream from Tilton, Ga. The Oostanaula River with the Etowah River, in turn, form the Coosa River at Rome, Ga. Characteristics of the Conasauga-Oostanaula Rivers system are given in table 8-7.

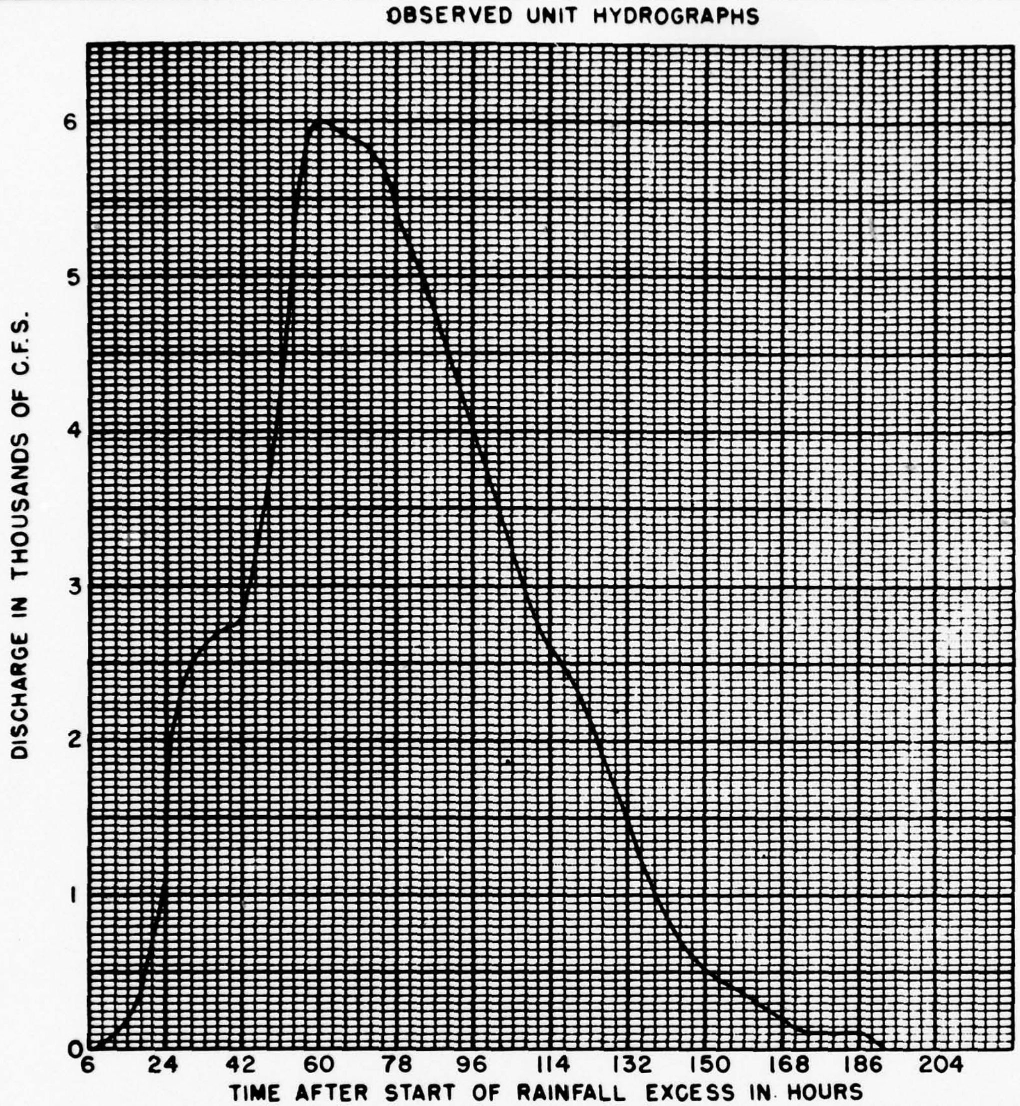
TABLE 8-7
PRINCIPAL STREAM CHARACTERISTICS

Stream and location	Drainage area (sq.mi.)	Miles above mouth	Reach to head: Length (miles)	Reach to head: Average slope (ft./mi.)
Conasauga River:				
Head	-	91.2	-	-
Jacks R. Dam site	86	74.4	16.8	140.0
Dalton Dam site	624	24.8	66.4	39.6
Tilton gage	682	12.0	79.2	33.5
Mouth	727	-	91.2	29.4
Oostanaula River:				
Head	1,592	46.95	-	-
Resaca gage	1,610	43.1	3.85	1.0
Rome gage	2,120	4.5	42.45	.97
Mouth	2,150	-	46.95	.92

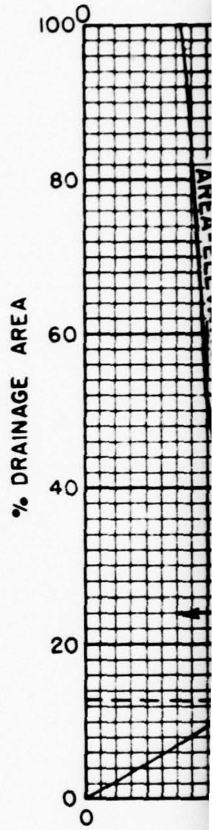
Existing Reservoir Storage

A USDA upstream watershed project for Mill Creek, part of the Coahulla Creek Basin, provides about 5,742 acre-feet of storage in six structures in the drainage basin area that would be controlled by Dalton Dam. In the watershed area of the Conasauga-Coosawattee-Oostanaula-Etowah Rivers in the headwaters area of the Coosa River, additional reservoir storage exists or is being provided as follows: *Carters Reservoir, now being built on the Coosawattee* River, will have 242,200 acre-feet of inactive storage, 134,900 acre-feet for power generation, and 95,700 acre-feet for flood control, plus an additional 31,900 acre-feet of induced-surcharge storage above the normal full pool; Allatoona Reservoir, in operation since 1949 on the Etowah River, has 82,900 acre-feet of inactive storage, from 119,900 to 284,600 acre-feet for seasonal power generation, and from 302,600 to 467,300 acre-feet of seasonal flood control capacity, with an added 108,000 acre-feet of induced-surcharge storage above the normal full pool. The USDA has six authorized upstream watershed projects with 75 reservoirs installed or to be installed, which will provide sediment retention and an estimated 98,600 acre-feet of storage for flood prevention, public water supply and recreation. These projects are: Talking Rock Creek, Sallocoa Creek Area, and Pine Log Tributary on tributaries of the Coosawattee River below Carters Reservoir; and, Pumpkinvine Creek, Raccoon Creek, and Euharlee Creek on tributaries of the Etowah River below Allatoona Reservoir.

CORPS OF ENGINEERS



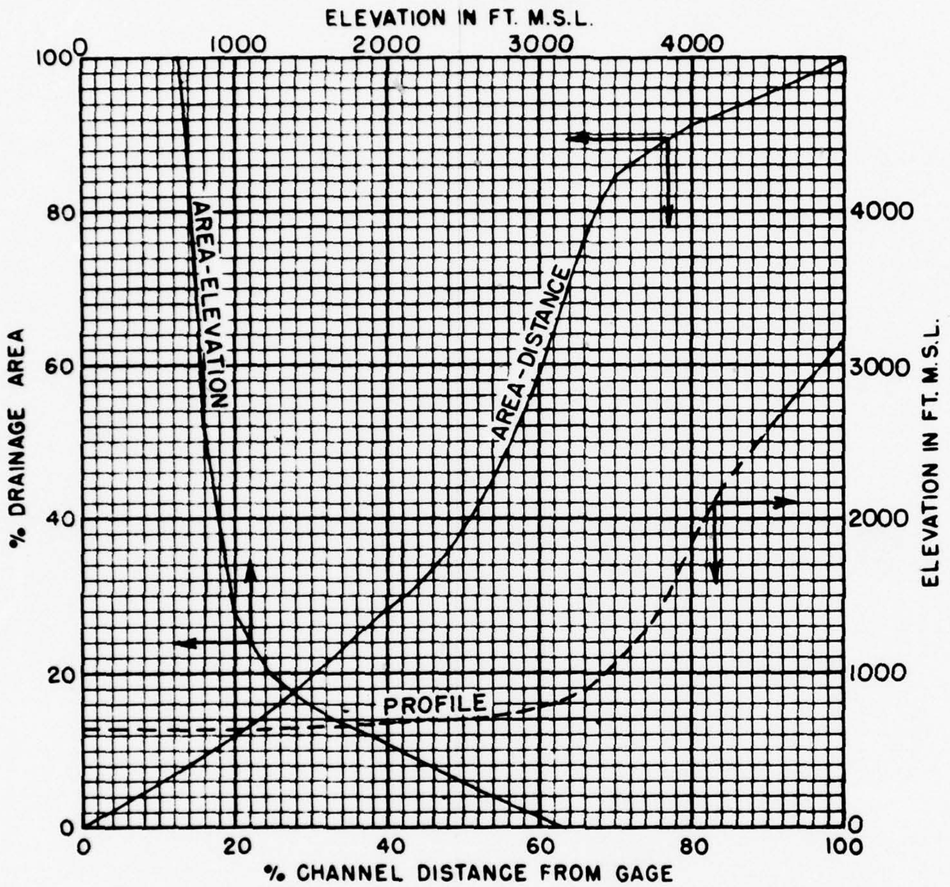
DRAINAGE AREA
MAXIMUM ELEVATION
MINIMUM ELEVATION
MEAN ELEVATION (weig
LAND SLOPE
MAIN STREAM SLOPE



DATA FROM OBSERVED UNIT HYDROGRAPHS													
DATE OF RAINFALL	LEGEND	AVE. P (In.)	RAINFALL EXCESS DURATION (hr.)	RAINFALL EXCESS AMOUNT (In.)	L_{cP} (mi.)	STAGE RECORD	Q_{pR} (cfs.)	Q_p tr = 6 hrs. (cfs.)	t_{pR} (hr.)	t_p (hr.)	t_v (hr.)	C_{tR}	C_p640
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
27-30 MARCH 1951	——	6.49	24	4.65	Dnstr.	Rec.	6,000	6,600	39	39	51	3.7	343

DRAINAGE AREA CHARACTERISTICS

DRAINAGE AREA	682 sq. mi.	L	68 mi.
MAXIMUM ELEVATION	3,150 ft. m.s.l.	L_{ca}	38 mi.
MINIMUM ELEVATION	622 ft. m.s.l.	$(LL_{ca})^{0.3}$	10.6
MEAN ELEVATION (weighted)	1,066 ft. m.s.l.	DRAINAGE DENSITY	mi/sq. mi.
LAND SLOPE	ft./mi.	MAP SCALE	1:1,000,000
MAIN STREAM SLOPE	5.6 ft./mi.	METHOD OF FLOW SEPARATION	TYPE C
		BASIN SHAPE FACTOR	6.78



OGRAPHS

Q_p tr = 6 hrs. (cfs.)	t_{pR} (hr.)	t_p (hr.)	t_v (hr.)	C_{tR}	$C_p 640$	K_m (hr.)	T_c (hr.)
(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
6,600	39	39	51	3.7	343	48.6	54

NOTES:

Prepared in accordance with EM 1110-2-1405, App. IV.

All data for Conasauga River at Tilton, Georgia.

COMPREHENSIVE PLAN OF DEVELOPMENT FOR WATER RESOURCES IN THE APPALACHIAN REGION

CONASAUGA RIVER AT TILTON, GA.

UNIT HYDROGRAPH SUMMARY

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Flood Frequencies

At the Tilton gage, immediately below the Daltom Dam site, minor flooding begins at a stage of 12 feet, which has a recurrence interval of about 2 months. Appreciable damage occurs about four times a year at a stage between 14 and 15 feet. Most of the floods and the larger floods occur in the period from December through April. However, there have been floods in every month except October.

Main Stem Rivers

At the Resaca gage, on the Oostanaula River, and the Rome gage on the Coosa River, floods occur about three times a year. Urban flooding at another Rome gage, on the Oostanaula River is less frequent due to levee protection occuring about once in 5 years. Backwater from the Etowah and Coosa Rivers affects stages at the Oostanaula River gage.

Modified Conditions

Since December 1949, Allatoona Reservoir has been regulated to provide protection to Rome, Ga., as well as Gadsden, Ala., farther downstream on the Coosa River. Since 1961, the Alabama Power Company's Weiss Dam, on the Coosa River, has been operated for flood control. Carters Dam, at present under construction on the Coosawattee River, will reduce flood damages along the river system to Mayos Bar, about 10 miles downstream from Rome. The Dalton Dam would provide additional flood protection on the Oostanaula and Coosa Rivers as well as on the Conasauga River. The effects of flood control operations at Dalton Dam on downstream damage points are shown in table 8-8.

TABLE 8-8
FLOOD FREQUENCY DATA

Recurrence frequency (yrs.)	Conasauga River at Tilton, Ga. Gage Datum: 622.28 ft., msl Damage Stage: Crop 12 ft. — Natural flows Stage (ft.)	Natural flows Discharge (cfs)	Modified flows Stage (ft.)	Modified flows Discharge (cfs)	Oostanaula River at Resaca, Ga. Gage Datum: 604.14 ft., msl Damage Stage: Crop 15 ft.: Urban 30 ft. — Natural flows[1/] Stage (ft.)	Natural flows[1/] Discharge (cfs)	Modified flows Stage (ft.)	Modified flows Discharge (cfs)
1	21.94	12,800	13.96	5,400	20.00	15,300	18.65	13,800
10	28.65	28,200	18.05	7,800	28.68	30,000	25.42	22,400
25	31.35	35,300	21.82	12,600	31,00	38,200	27.08	25,500
50	33.35	41,400	25.10	19,600	32.55	44,800	28.55	29,600
100	35.35	47,400	29.40	30,000	34.30	54,400	30.45	36,200

Recurrence frequency (yrs.)	Oostanaula River at Rome, Ga. Gage Datum: 561.70 ft., msl Damage Stage: Urban 27 ft. — Natural flows Stage (ft.)	Natural flows Discharge (cfs)	Modified flows[2/] Stage (ft.)	Modified flows[2/] Discharge (cfs)	Coosa River at Rome, Ga. Gage Datum: 553.05 ft., msl Damage Stage: Crop 19 ft. — Natural flows Stage (ft.)	Natural flows Discharge (cfs)	Modified flows[2/] Stage (ft.)	Modified flows[2/] Discharge (cfs)
1	19.20	15,800	17.60	14,400	23.50	27,400	23.50	27,400
10	26.48	24,400	24.28	21,300	31.35	40,700	31.22	40,400
25	28.82	28,400	26.55	24,600	33.80	47,300	33.52	46,500
50	30.38	32,000	27.95	26,800	35.27	52,000	35.10	51,400
100	31.73	35,400	29.20	29,200	36.45	56,500	36.30	55,900

1/ Includes estimated effect of Carters Dam, now being built.

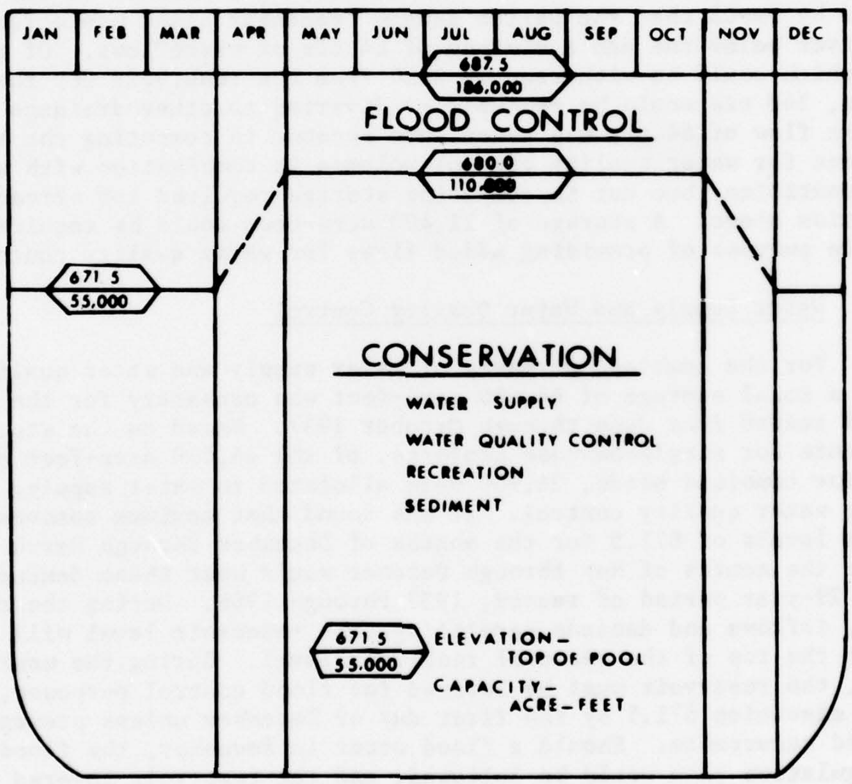
2/ Includes estimated effects of existing Allatoona Dam as well as Carters Dam, now being built.

Area and Capacity Curves

Areas of the Dalton Reservoir surface for various elevations were planimetered from USGS quadrangle sheets with contours at 20-foot intervals. Using these data, the capacity curve was computed by the standard procedure. The area and capacity curves are presented on exhibit 8-13.

Storage Allocation to Proposed Purposes

The Dalton Reservoir project is designed to provide storage for water supply, streamflow augmentation for water quality control, flood control, and sediment retention, as well as to support water-based and other outdoor recreation. The following figure shows the reservoir's capacity segments allocated to the various project functions, including the seasonal adjustments to provide increased conservation storage during the period of greater drawdown and recreation attendance, and the basic flood control storage during the period when most major floods have been recorded. Thus it will be seen that 55,000 acre-feet will be allocated to the primary purpose of the instant season.



Conservation Storage Vs. Yield

Storage was allocated to meet year 2020 water supply and water quality control demands as determined by the Federal Water Pollution Control Administration. The recreation pool elevation and the storage for flood control were determined on the basis of economic studies.

Water Supply

Year 2020 water supply demand would be 137 million gallons per day (mgd) or 212 cfs. To meet this demand during the driest period of record for the Tilton gage, June through October 1947, 34,900 acre-feet of stored water would have been required besides the total inflow to the reservoir.

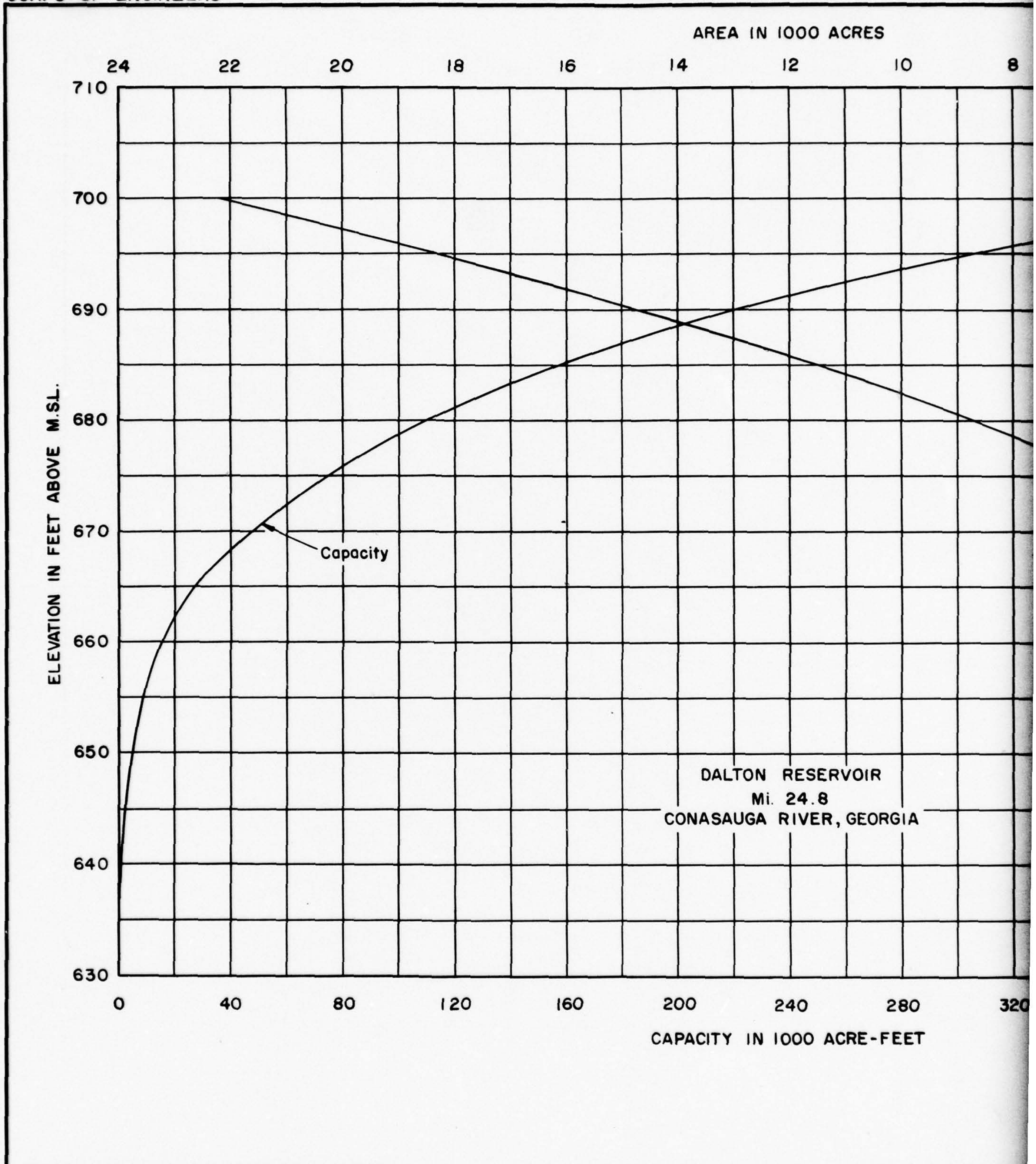
Water Quality Control

In the vicinity of the Tilton gage, below the dam, year 2020 water quality flow requirements would be 80 cfs for December through February, 95 cfs for November and March, 130 cfs during October, 190 cfs for April and May, and 226 cfs for June through September. It was also estimated by FWPCA that the Dalton sewage treatment plant would return to the river below the dam a minimum of 64 cfs of wasteflows. Of the 212 cfs which would be withdrawn by 2020 from the reservoir for the city of Dalton, 148 cfs would be consumed or diverted to other drainage basins. The return flow of 64 cfs was taken into account in computing the storage requirement for water quality control volumes in combination with water supply quantities, but not in computing storage required for streamflow augmentation alone. A storage of 11,400 acre-feet would be required for the single purpose of providing added flows for water quality control.

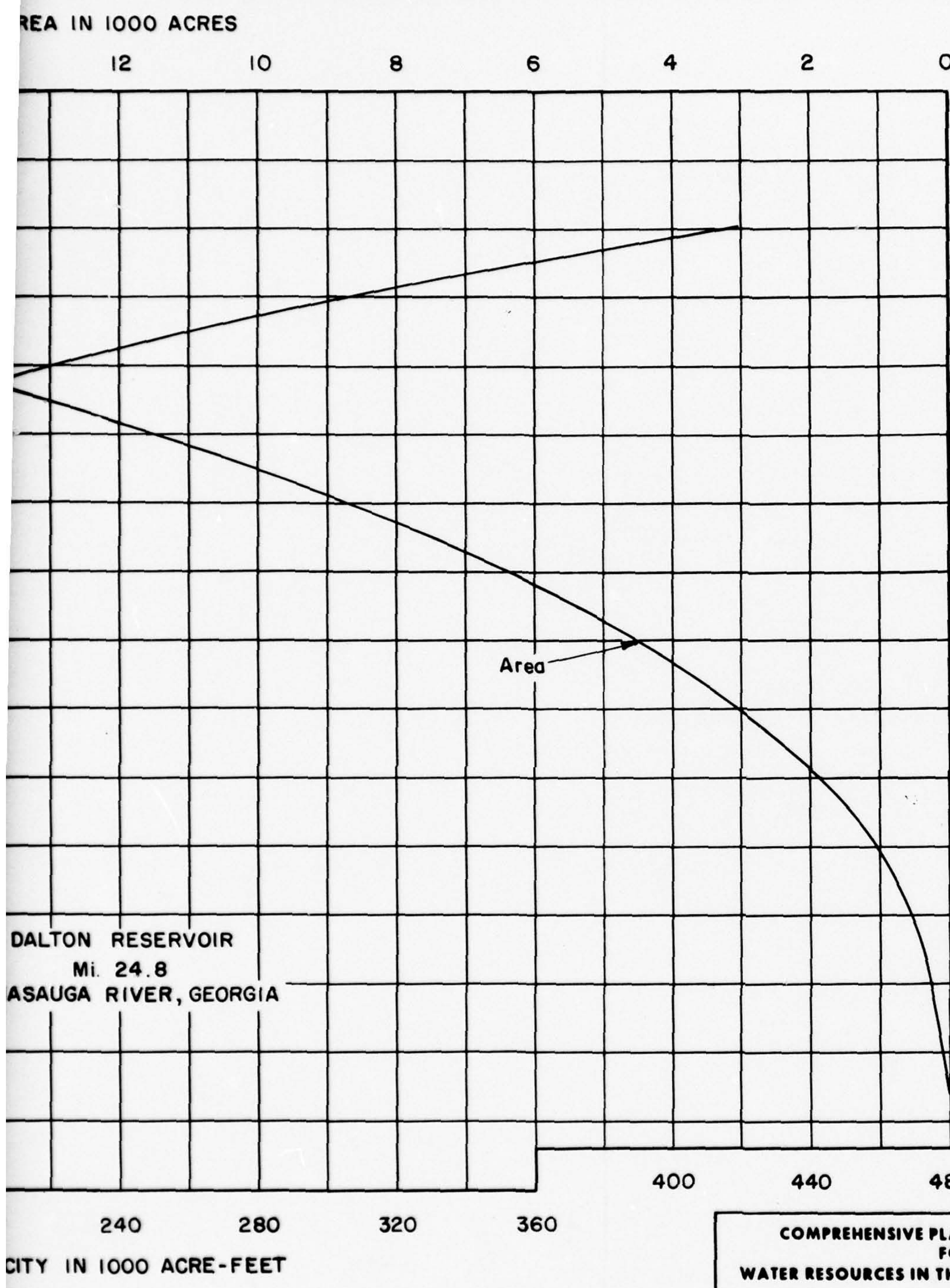
Water Supply and Water Quality Control

For the combined purposes of water supply and water quality control, a total storage of 46,600 acre-feet was necessary for the driest period of record from June through October 1947. Based on the storage requirements for single-purpose projects, of the 46,600 acre-feet of storage for combined needs, 34,900 were allocated to water supply, and 11,700 to water quality control. It was found that maximum seasonal reservoir levels of 671.5 for the months of December through March and 675.0 for the months of May through October would meet these demands for the full 29-year period of record, 1937 through 1966. During the month of April, inflows and demands permitting, the reservoir level will be raised to the top of the seasonal reservoir level. During the month of November, the reservoir must be lowered for flood control purposes, reaching elevation 671.5 by the first day of December unless prevented by a flood occurrence. Should a flood occur in November, the flood controll regulation plan would be followed, and the reservoir lowered to elevation 671.5 as soon as feasible.

CORPS OF ENGINEERS



U.S. ARMY



COMPREHENSIVE PLAN OF DEVELOPMENT
FOR
WATER RESOURCES IN THE APPALACHIAN REGION

DALTON RESERVOIR, GEORGIA

AREA AND CAPACITY CURVES

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Examination of the streamflow records of the Oostanaula River at the Resaca gage, 28.3 miles below the Dalton Dam site, reveals that a major drought, of a recurrence frequency of about once in 109 years, was experienced in 1904. This drought is considerably less frequent than the most severe which occurred during the period of record for the Tilton gage. A correlation curve for streamflows at Resaca and Tilton was constructed, and hypothetical reservoir operations with inflows derived from the curve were analyzed for the 1904 low flow period. It was found that a recurrence of this dry period would result in a maximum drawdown to elevation 655.5, or 8.5 feet below the adopted minimun pool level at elevation 664. Storage in the Dalton Reservoir of about 63,500 acre-feet would be required to meet the demands during the 1904 period. Therefore, it was found that the 85,600 acre-feet between the recreation pool, elevation 680, and the minimum pool, elevation 664, would be adequate only if the reservoir were full to the seasonal pool elevation when the drought began. A straight-line interpolation between the 109-year drawdown to elevation 655.5 and the 44-year drawdown to elevation 670 (the lowest with flows recorded at Tilton) results in a recurrence frequency of about once in 64 years for a drawdown to the adopted minimum pool elevation of 664. Designing the project on the basis of operating it for the demand during a recurring 1904 dry period was considered ultraconservative. It was concluded that the provision of water use storage capable of meeting the needs during the drought of record at the Tilton gage, with a reserve of 22,000 acre-feet for partial protection against the more severe droughts, such as that of 1904, was adequate for project planning. It was also realized that in the latter period of the 100-year project life, storage in the reservoir would be depleted to some degree by sediment deposition and that this could aggravate the water supply deficiency resulting from a drought similar to that of 1904. This, however, had no bearing on the project's formulation since the probability of such an event occurring under the assumed stringent circumstances is remote, and the effect relative to the long beneficial project life would be subordinate. Moreover, available reservoir capacity would permit modifications in the reservoir regulation plan to suit changed future conditions and needs.

Flood Control

Storages of 1, 2, and 4 watershed-inches were investigated for flood control. A 4-inch capacity, amounting to approximately 131,000 acre-feet, was found to be most effective and was adopted for the primary flood control storage. In order to provide a measure of additional control for the floods exceeding the reservoir's capacity, induced-surcharge operations would be employed. This would result in storage of 82,000 acre-feet of floodwater in the surcharge zone before the spillway gates would be fully opened. In the event of a standard project flood, this amount of induced-surcharge storage would compensate for lost valley storage under the 1- and 2-inch-storage plans and would more than compensate for such lost storage under the 4-inch-storage

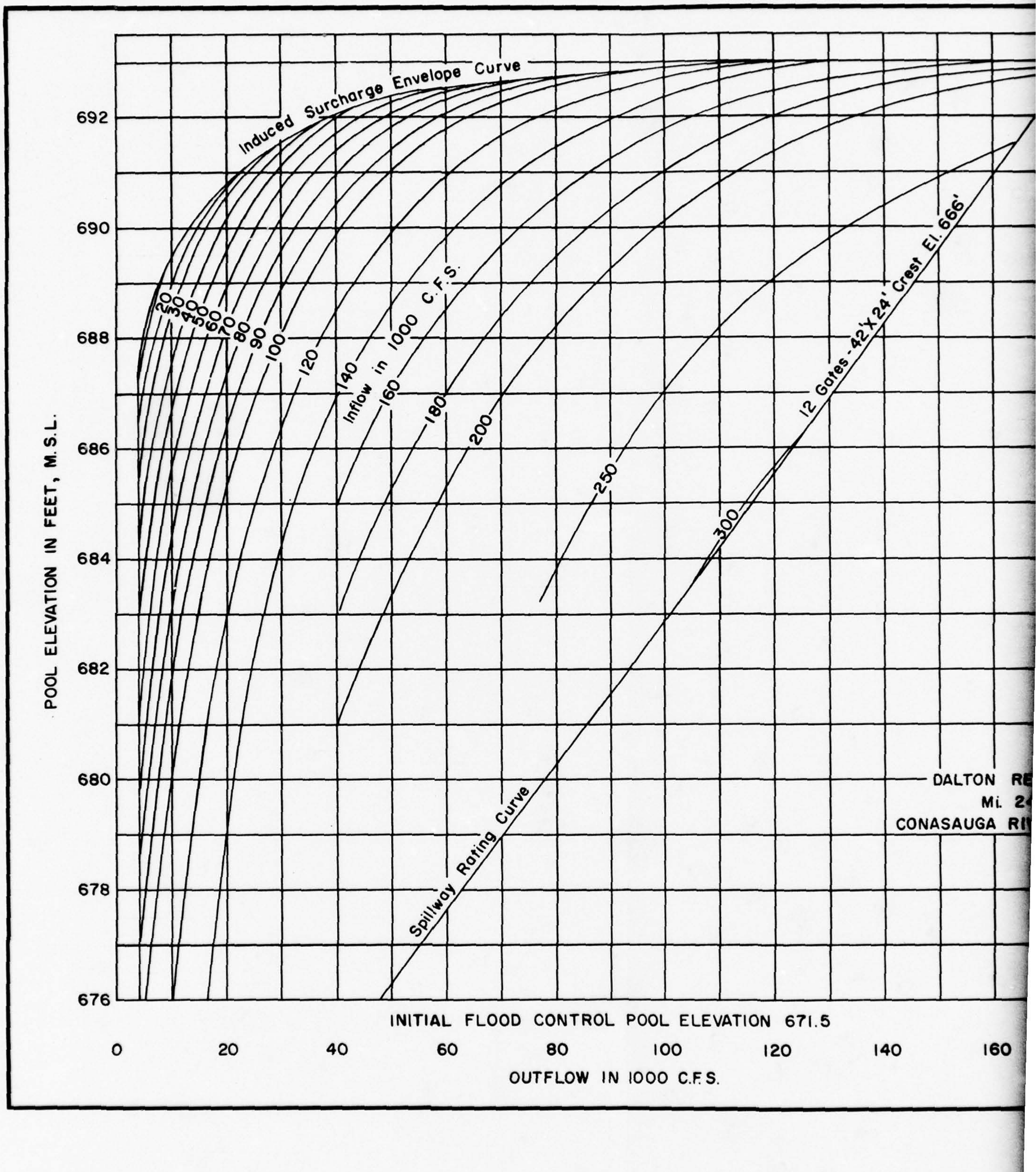
scheme. Adoption of the induced-surcharge storage for Dalton Reservoir would allow keeping peak outflows smaller than the natural peak discharge. The spillway gate regulation schedule for the 4-inch-storage scheme is shown on exhibit 8-14. More detailed studies of the induced-surcharge storage allocations would be made in preconstruction planning. This might result in a minor lowering of the top induced surcharge elevation.

<u>Sediment</u>

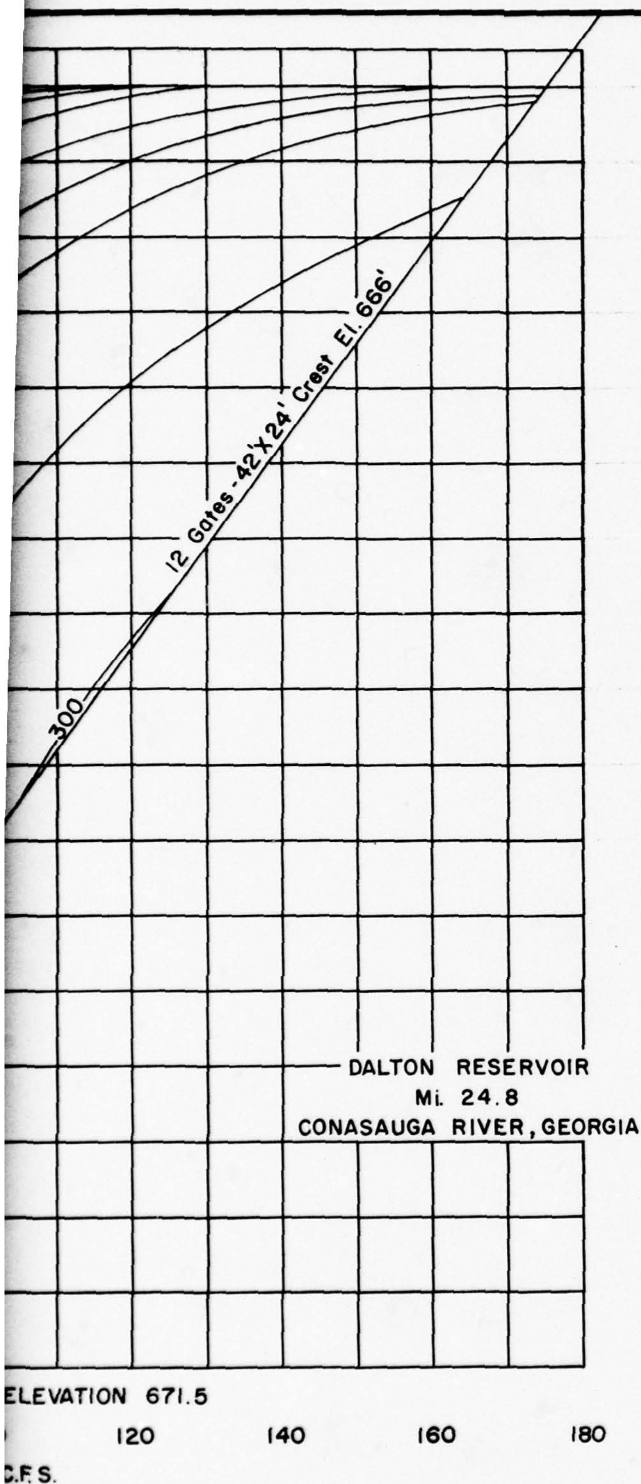
The topography of the eastern and northern portion of the Conasauga River Basin is mountainous, while to the south and west, the land surface is characterized by rolling hills. The greater amount of relief in the uppermost portion of the basin intensifies runoff velocities and thereby enables a large amount of sediment to be moved during rainfall and periods of high river discharge. The soil in this part of the basin is composed mainly of sandy loam which is easily eroded when exposed. During rainfall, all particle sizes available for transport, from clay to sand and rock sizes, are moved down the slopes and into the river. After the rainfall subsides and flow velocities decrease, most suspended material drops to the riverbed, and the river begins to clear quickly. The relatively rapid clearing is due to the low percentage of very small particle sizes in the soil in the headwater area.

The sediment characteristics of the Conasauga River between its mouth and about mile 50 differ distinctly from those of the headwater reaches. Major differences are noted in the types and amounts of sediment transported and the speed with which erosion and deposition occurs. In contrast to the upper reaches, where runoff rates are higher and erosion occurs rapidly, the stream gradients of the tributaries joining the lower portion of the river are more moderate, and erosion rates are lower. Below mile 50, the sediment yield per square mile is estimated to be about 0.73 acre-foot per year. While this is less than the yield above mile 50, the lower river has a much greater sediment-transporting capacity.

The type of sediment carried in suspension near the mouth of the river is predominantly clay and silt. Based on a 6-month average of daily samples taken from the Conasauga River at Tilton, 12 miles upstream from the mouth, only 1 percent of the suspended load was sand, while the remainder was divided between silt and clay. These small particle sizes do not require swift velocities to be transported and can remain in suspension for long periods at low velocities. Sand normally moves as bed material, although, particularly during high water periods, velocities can be attained which suspend it and move it long distances.



Induced Surcharge Envelope Curve
Inflow in 1000 C.F.S.
20
30
40
50
60
70
80
90
100
120
140
160
180
200
250
300
12 Gates - 42' X 24' Crest El. 666'
Spillway Rating Curve
POOL ELEVATION IN FEET, M.S.L.
692
690
688
686
684
682
680
678
676
INITIAL FLOOD CONTROL POOL ELEVATION 671.5
0
20
40
60
80
100
120
140
160
OUTFLOW IN 1000 C.F.S.
DALTON RE
Mi. 24
CONASAUGA RI



COMPREHENSIVE PLAN OF DEVELOPMENT
FOR
WATER RESOURCES IN THE APPALACHIAN REGION

DALTON RESERVOIR, GEORGIA

SPILLWAY RATING

AND REGULATION CURVES

EXHIBIT 8-14

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The estimated bedload with the suspended load as measured at Tilton for the 1963 water year result in a sediment yield of 878 tons per day. The total deposition expected of a 100-year period in Dalton Reservoir is 24,400 acre-feet. Although the greater part of the sediment would be deposited at elevations higher than 664 feet, at the months of streams entering the reservoir, the storage available below that level would provide equivalent space for maintaining the storage capacity allocated to other purposes. Therefore, sedimentation will have no significant effect on the life of the reservoir or allocation of storage.

Recreation

In the interest of the most economical project, the summer recreation pool was set at elevation 680. Should the largest volume flood occur with the reservoir at elevation 680, the pool would reach a peak elevation of 690.6 or 2.4 feet below the highest induced surcharge elevation. The seasonal conservation storage curve is shown on exhibit 8-15 and the figure in the preceding paragraph on storage allocation.

Hydropower

There is no hydropower proposed for the Dalton Reservoir project.

Standard Project Flood

In accordance with criteria contained in Civil Works Engineer Bulletin No. 52-8, "Standard Project Flood Determinations," 50 percent of the spillway design flood was adopted as the standard project flood. The peak discharge of the standard project flood would be 113,000 cfs, and the volume of runoff under the hydrograph, 12.1 inches.

Spillway Design Flood

The spillway design storm rainfall was developed for the 624-square-mile drainage area above the Dalton Dam site by using criteria in Hydrometeorological Report No. 33. The rainfall volume thus computed amounted to 25.3 inches in 48 hours. A constant loss of 0.05 inch per hour was applied to the rainfall volume and resulted in a rainfall excess amount of 22.9 inches. A unit hydrograph determination for the March 1951 storm was made for the Conasauga River at Tilton, Ga. It included adjustment of the observed 24-hour unit hydrograph to a 6-hour unit hydrograph. (See exhibit 8-12, 8-16 and 8-17.) The adjusted 6-hour unit hydrograph was transferred to the Dalton Dam site and then modified for a 50-percent peaking. The resultant unit hydrograph was adopted for the spillway design flood. Applying the adopted unit hydrograph to the rainfall excess amounts and adding a base flow of 1,600 cfs (approximately 2.5 cfs per square miles) resulted in a hydrograph with 23.6 inches of volume and a peak discharge of 224,300 cfs. (See exhibit 8-18.)

Recommended Spillway

The spillway recommended for the Dalton Dam is a concrete, gated structure with the crest at elevation 666 surmounted by twelve 42-foot-wide by 24-foot-high tainter gates. However, during preconstruction planning, studies will be made to determine whether numbers and dimensions of gates could be amended to effect economies in project costs. The natural tailwater and spillway rating curves are shown on exhibit 8-19.

Flood Routing Conditions

All floods except the spillway design flood were assumed as occurring with the reservoir pool at the applicable maximum seasonal elevation. In routing the spillway design flood, it was assumed that the reservoir was full, from a prior flood, to the normal full pool level, elevation 687.5.

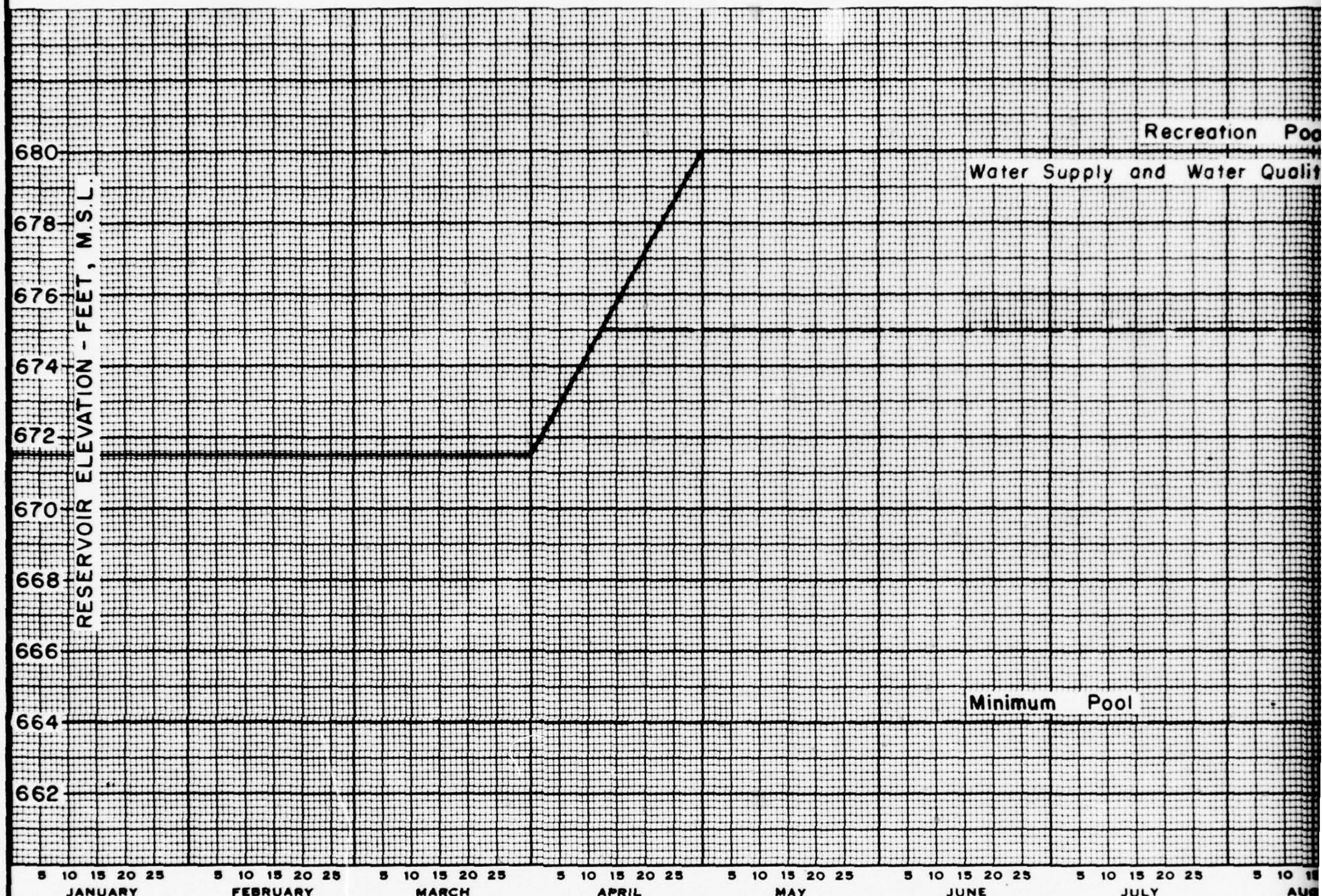
Flood Control Regulation Plan

All inflows up to 4,000 cfs, the approximate bankfull flow downstream, would be discharged. With inflows exceeding 4,000 cfs, a constant outflow of 4,000 cfs would be discharged until the pool would peak and then recede to the seasonal reservoir level or until the induced surcharge schedule would call for larger releases. Should the induced surcharge schedule operation be used, it would be followed until the pool would peak. Under induced-surcharge operation, the gates would be left in the highest setting required for the particular flood until the pool would recede to the maximum seasonal reservoir level. In operating the reservoir during a spillway design flood, the induced surcharge schedule would be followed until all gates would be opened fully. Free overflow would then prevail until the pool would peak and recede to maximum seasonal reservoir level.

Flood Routing Results

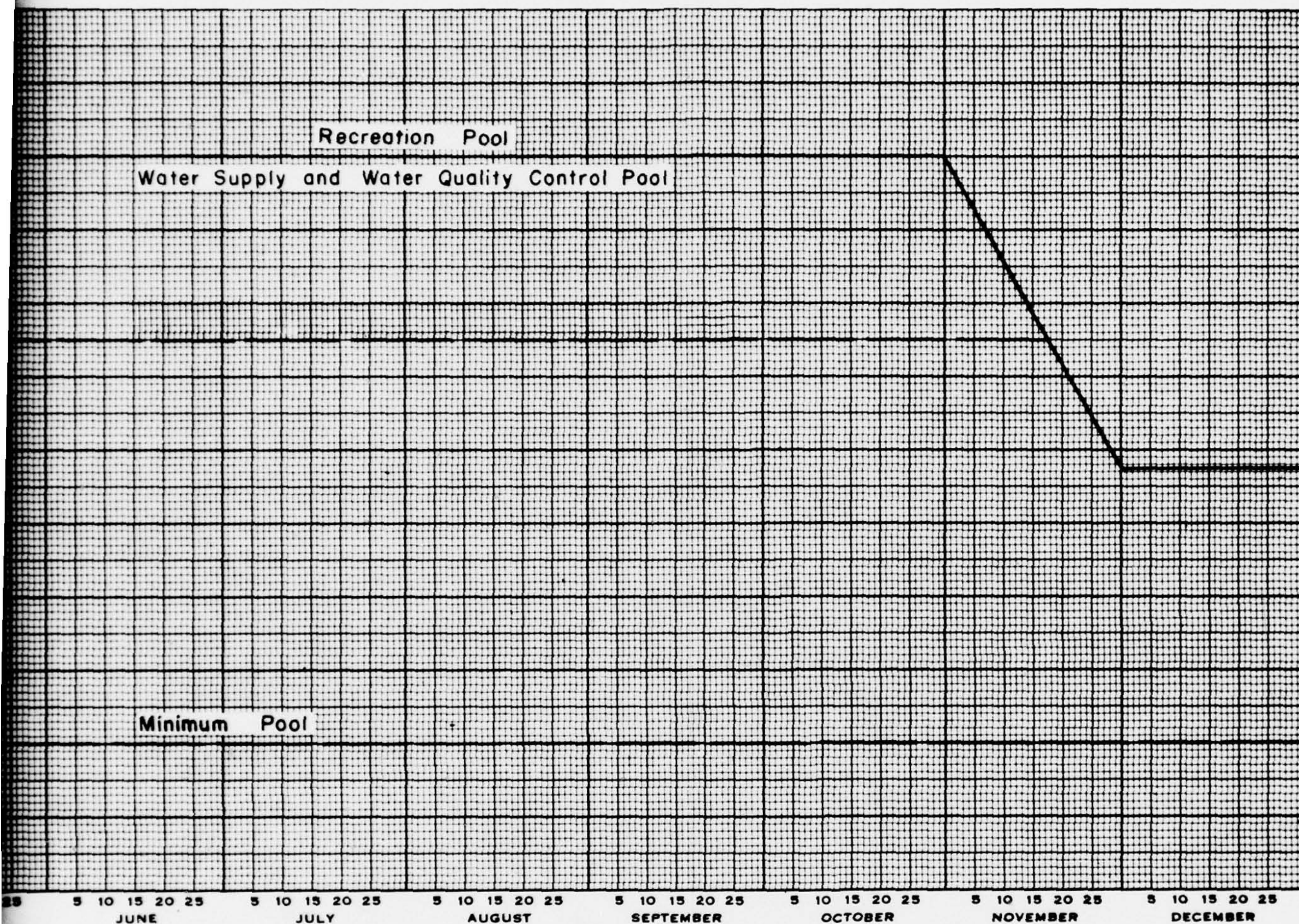
Following the above-outlined flood control plan, the regulated peak discharges and the peak pool elevations for some of the more important floods are as follows:

Flood	Peak Discharge Natural (cfs)	Peak Discharge Regulated (cfs)	Peak Pool Elevation (feet, msl)
Spillway design	224,300	188,500	694.6
Standard project	113,000	50,000	692.4
January 1947	24,900	11,100	689.6
March 1951	27,700	4,000	687.0



DALTON RESERVOIR
Mi. 24.8
CONASAUGA RIVER, GEORGIA

U.S. ARMY



DALTON RESERVOIR
Mi. 24.8
CONASAUGA RIVER, GEORGIA

COMPREHENSIVE PLAN OF DEVELOPMENT FOR WATER RESOURCES IN THE APPALACHIAN REGION

DALTON RESERVOIR, GEORGIA

SEASONAL STORAGE LIMITS

EXHIBIT 8-15

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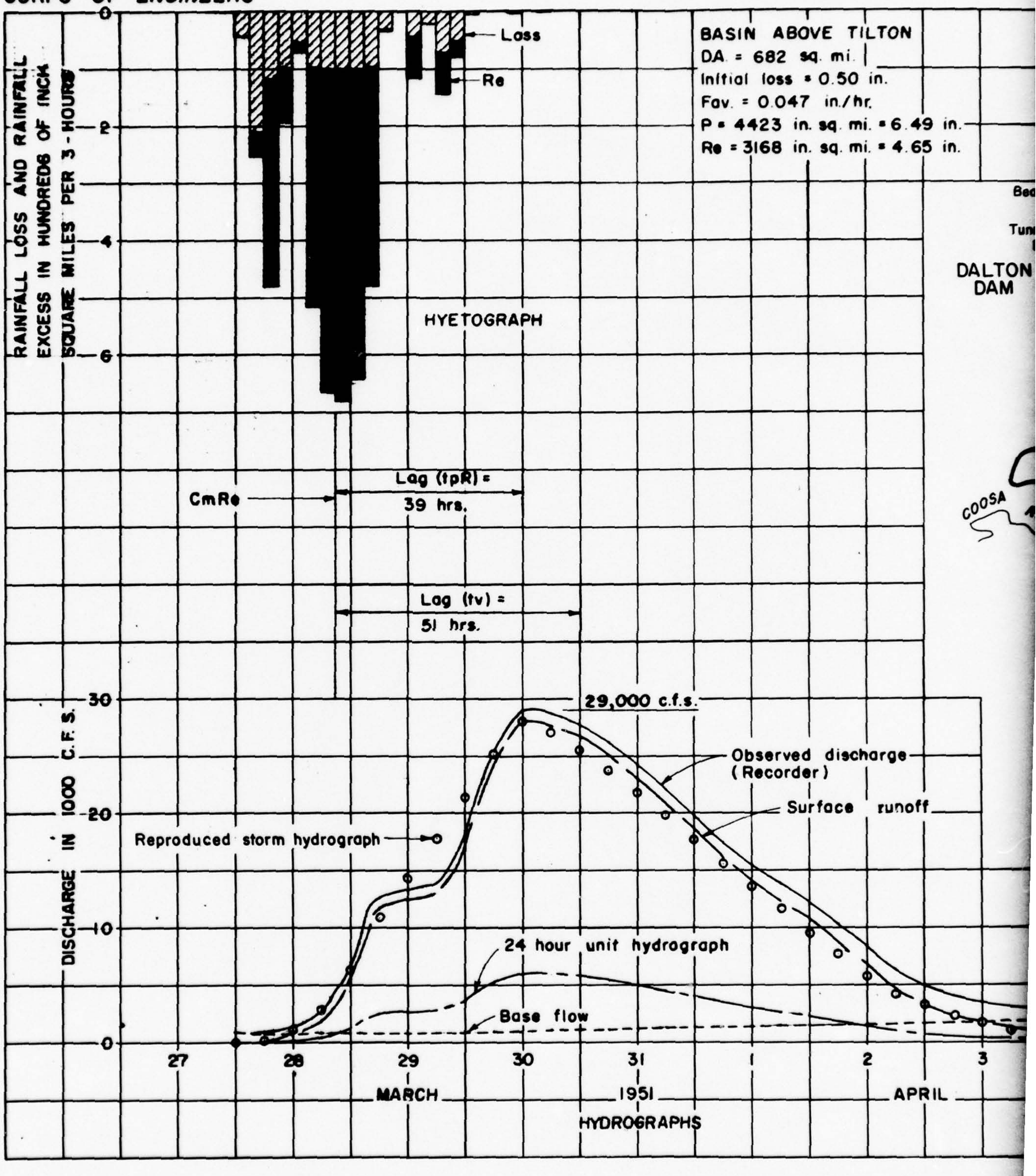
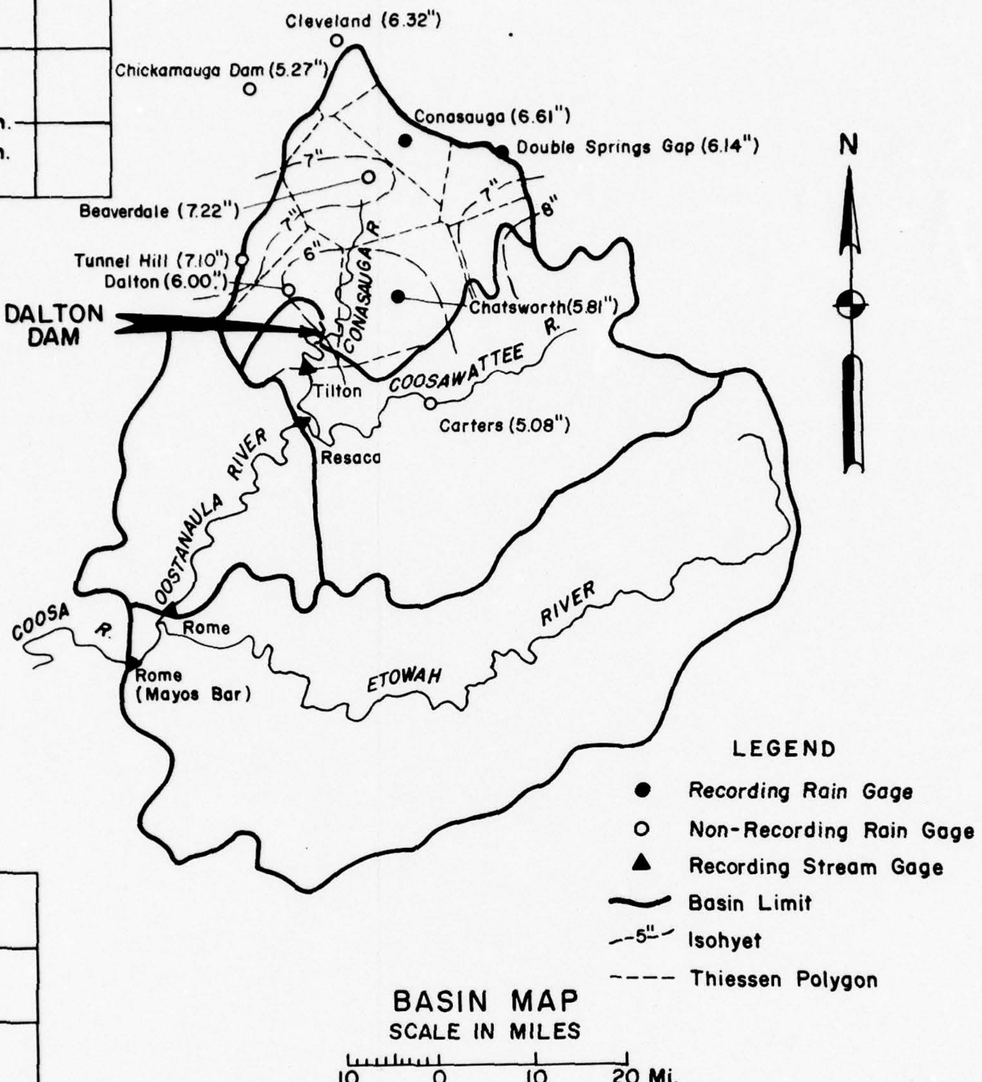
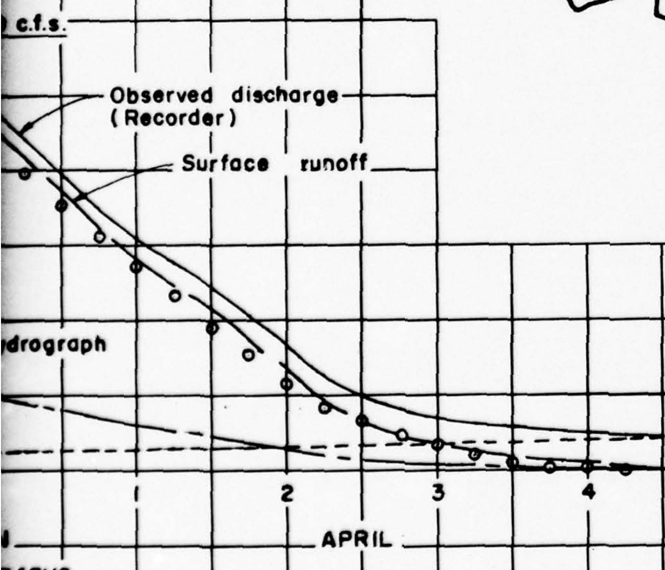


U.S. ARMY

BASIN ABOVE TILTON
DA. = 682 sq. mi.
Initial loss = 0.50 in.
Fav. = 0.047 in./hr.
P = 4423 in. sq. mi. = 6.49 in.
Re = 3168 in. sq. mi. = 4.65 in.





NOTE:
Storm of 27-30 March 1951 Conasauga River at Tilton, Georgia.

COMPREHENSIVE PLAN OF DEVELOPMENT FOR WATER RESOURCES IN THE APPALACHIAN REGION

CONASAUGA RIVER AT TILTON, GA.

UNIT HYDROGRAPH DETERMINATION

EXHIBIT 8-16

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COMPUTED BY R.W.K. Date 3-10-56

UNIT HYDROGRAPH DETERMINATION

STREAM CONASAUGA RIVER LOCATION TILTON, GA.

DRAINAGE AREA 682 SQ. MI.

STORM OF 27-30 March 1951 PREPARED BY MOBILE DISTRICT, SOUTH ATLANTIC DIVISION

AV. RAINFALL 6.49 INCHES; RAINFALL-EXCESS 4.65 INCHES FAV., 0.047 IN./HR.

L 68 mi.; L_{ca} 38 mi.; $(LL_{ca})^{0.3}$ 10.6, t_R 24 hrs.;

LAG(t_{pR}) 39 hrs.; C_tR 3.7; q_{pR} 8.8 cfs/sq.mi.; C_p640 343

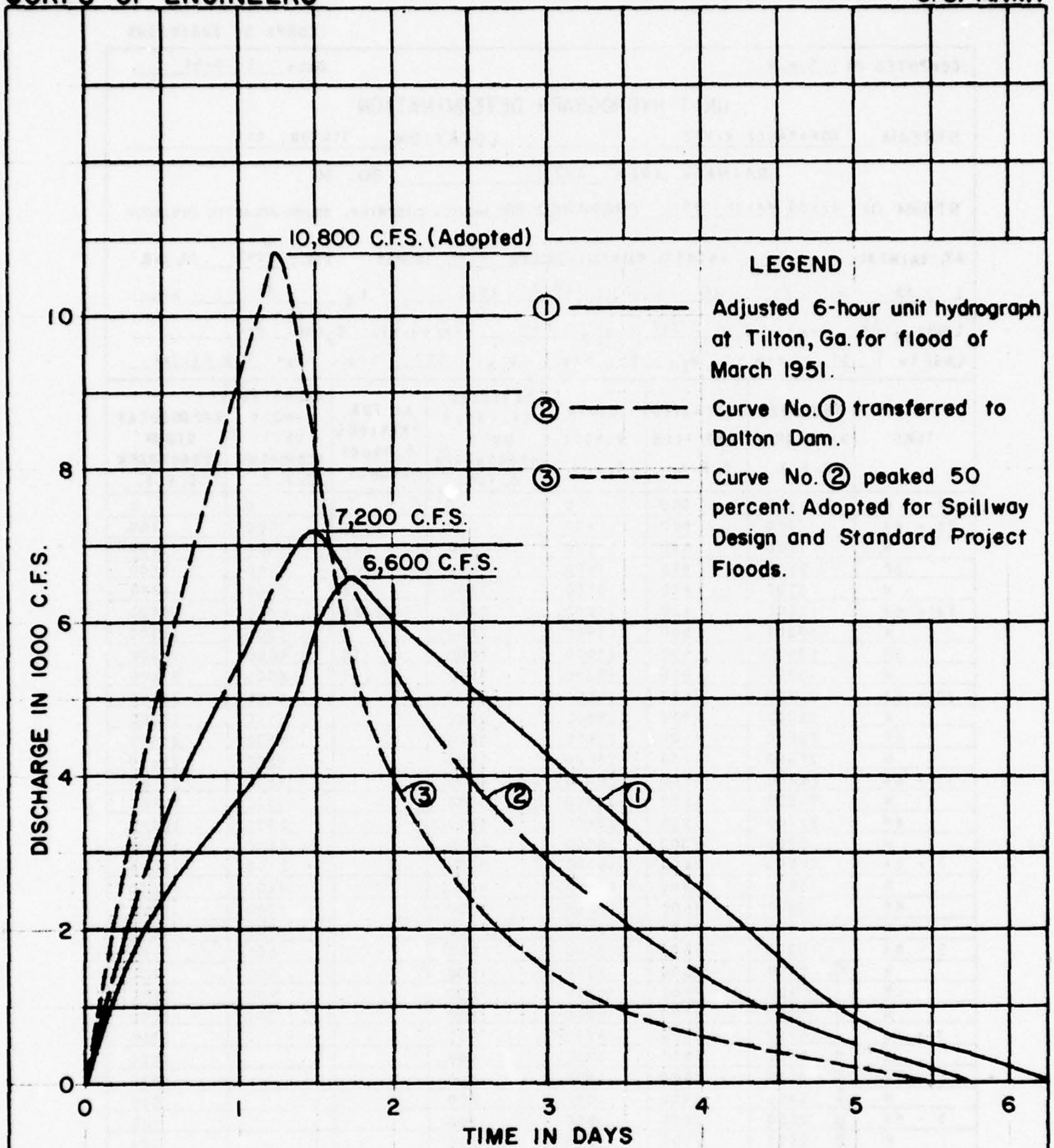
LAG(tv) 51 hrs.; W_{50} 65 hrs.; W_{75} 39 hrs.; Sst 5.6 ft./mi.

TIME	OBSERVED DISCHARGE C. F. S.	ESTIMATED BASE FLOW C. F. S.	STORM RUNOFF C. F. S.	OBSERVED 24 -HOUR UNIT HYDROGRAPH C. F. S.	Re FOR PREVIOUS 6_HOURS INCHES	ADJUSTED 6-HOUR UNIT HYDROGRAPH C. F. S.	REPRODUCED STORM HYDROGRAPH C. F. S.
27 - M	900	900	0	0		0	0
28 - 6A	900	800	100	0	.06	1500	100
M	1400	800	600	100	.67	2400	1100
6P	2600	800	1800	400	.64	3100	2800
M	6500	800	5700	1200	1.68	3700	6300
29 - 6A	12600	800	11800	2500	1.36	4500	10800
M	13300	800	12500	2700		6000	14300
6P	13900	900	13000	2800	.10	6600	17900
M	18200	900	17300	3700	.14	6000	21400
30 - 6A	25200	1000	24200	5200		5600	25300
M	29000	1000	28000	6000		5100	28000
6P	28600	1100	27500	5900		4700	27100
M	27800	1100	26700	5800		4300	25600
31 - 6A	26200	1200	25000	5400		3800	23700
M	24200	1200	23000	5000		3300	21800
6P	22100	1300	20800	4500		2900	19800
M	19800	1300	18500	4000		2500	17700
1 - 6A	17500	1400	16100	3500		2100	15600
M	15500	1400	14100	3000		1600	13600
6P	13800	1500	12300	2600		1200	11600
M	12200	1500	10700	2300		800	9500
2 - 6A	10300	1600	8700	1900		600	7700
M	8400	1600	6800	1500		500	5700
6P	6300	1700	4600	1000		400	4200
M	5000	1700	3300	700		200	3200
3 - 6A	4100	1800	2300	500		0	2300
M	3500	1800	1700	400			1800
6P	3100	1900	1200	300			1000
M	2900	1900	1000	200			500
4 - 6A	2600	2000	600	100			100
M	2500	2000	500	100			100
6P	2400	2100	300	100			0
M	2200	2200	0	0			
Total	385,500	44,800	340,700	73,400	4.65	73,400	340,600
29 - 6P	6-HOUR UNIT HYDROGRAPH PEAK					6600	
30 - M	29000	1000	28000	6000	PEAK		

RECESSIONAL VALUES

COMPREHENSIVE PLAN OF DEVELOPMENT
FOR
WATER RESOURCES IN THE APPALACHIAN REGION
CONASAUGA RIVER AT TILTON, GA.

UNIT HYDROGRAPH DETERMINATION



NOTE:
6-Hour unit hydrographs at the Dalton Dam Site and the Tilton Gage, Conasauga River, Georgia.

COMPREHENSIVE PLAN OF DEVELOPMENT FOR WATER RESOURCES IN THE APPALACHIAN REGION

DALTON RESERVOIR, GEORGIA

UNIT HYDROGRAPHS

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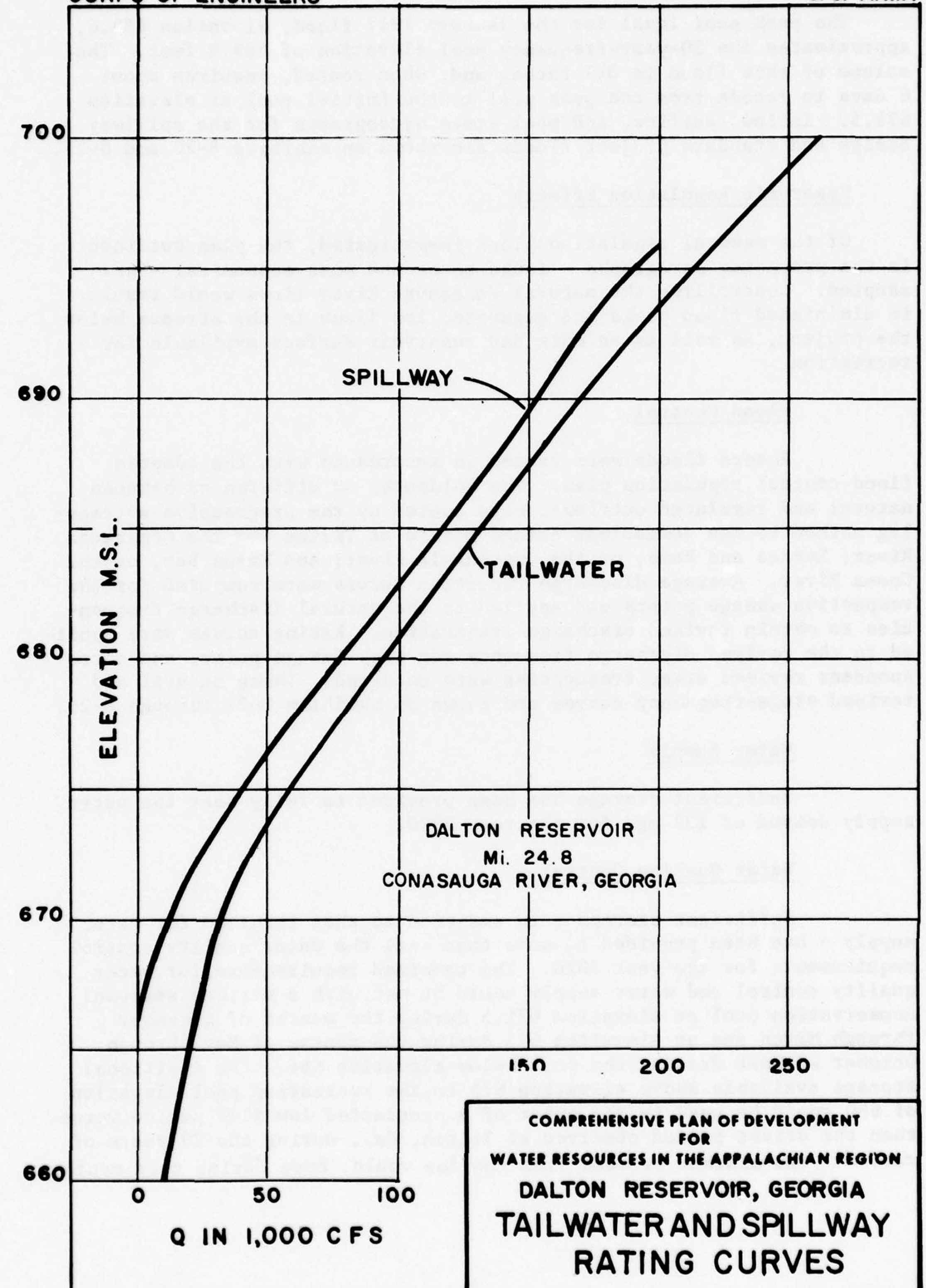

COMPREHENSIVE PLAN OF DEVELOPMENT
FOR
WATER RESOURCES IN THE APPALACHIAN REGION

DALTON RESERVOIR, GEORGIA

TAILWATER AND SPILLWAY RATING CURVES

EXHIBIT 8-19

The peak pool level for the January 1947 flood, elevation 689.6, approximates the 50-year-frequency pool elevation of 689.8 feet. The volume of this flood is 8.1 inches and, when routed, requires about 6 days to recede from the peak pool to the initial pool at elevation 671.5. Inflow, outflow, and pool stage hydrographs for the spillway design and standard project floods are shown on exhibits 8-20 and 8-21.

Reservoir Regulation Effects

Of the several regulation plans investigated, the plan outlined in the preceding paragraphs - found to be the most economical - was adopted. Controlling the natural Conasauga River flows would result in diminished flood peaks and augmented low flows in the streams below the project, as well as an extended reservoir surface available for recreation.

Flood Control

Record floods were routed in accordance with the adopted flood control regulation plan. The holdouts, or differences between natural and regulated outflows, were routed by the progressive average-lag method to the downstream damage points at Tilton, on the Conasauga River; Resaca and Rome, on the Oostanaula River; and Mayos Bar, on the Coosa River. Average discharge reduction curves were computed for the respective damage points and applied to the natural discharge frequencies to obtain revised discharge frequencies. Rating curves were applied to the revised discharge frequency for each damage point, and correspondent revised stage frequencies were obtained. These natural and revised stage-frequency curves are shown on exhibits 8-22 through 8-25.

Water Supply

Sufficient storage has been provided to fully meet the water supply demand of 137 mgd for the year 2020.

Water Quality Control

Sufficient storage - in addition to that required for water supply - has been provided to more than meet the water quality control requirements for the year 2020. The combined requirements for water quality control and water supply could be met with a maximum seasonal conservation pool at elevation 671.5 during the months of December through March and at elevation 675 during the months of May through October without drawing the pool below elevation 664. The additional storage available above elevation 675 to the recreation pool elevation of 680 could be used in the event of a protracted low flow period worse than the driest period observed at Tilton, Ga., during the 29 years of record. The minimum release from the dam would, even during cold months,

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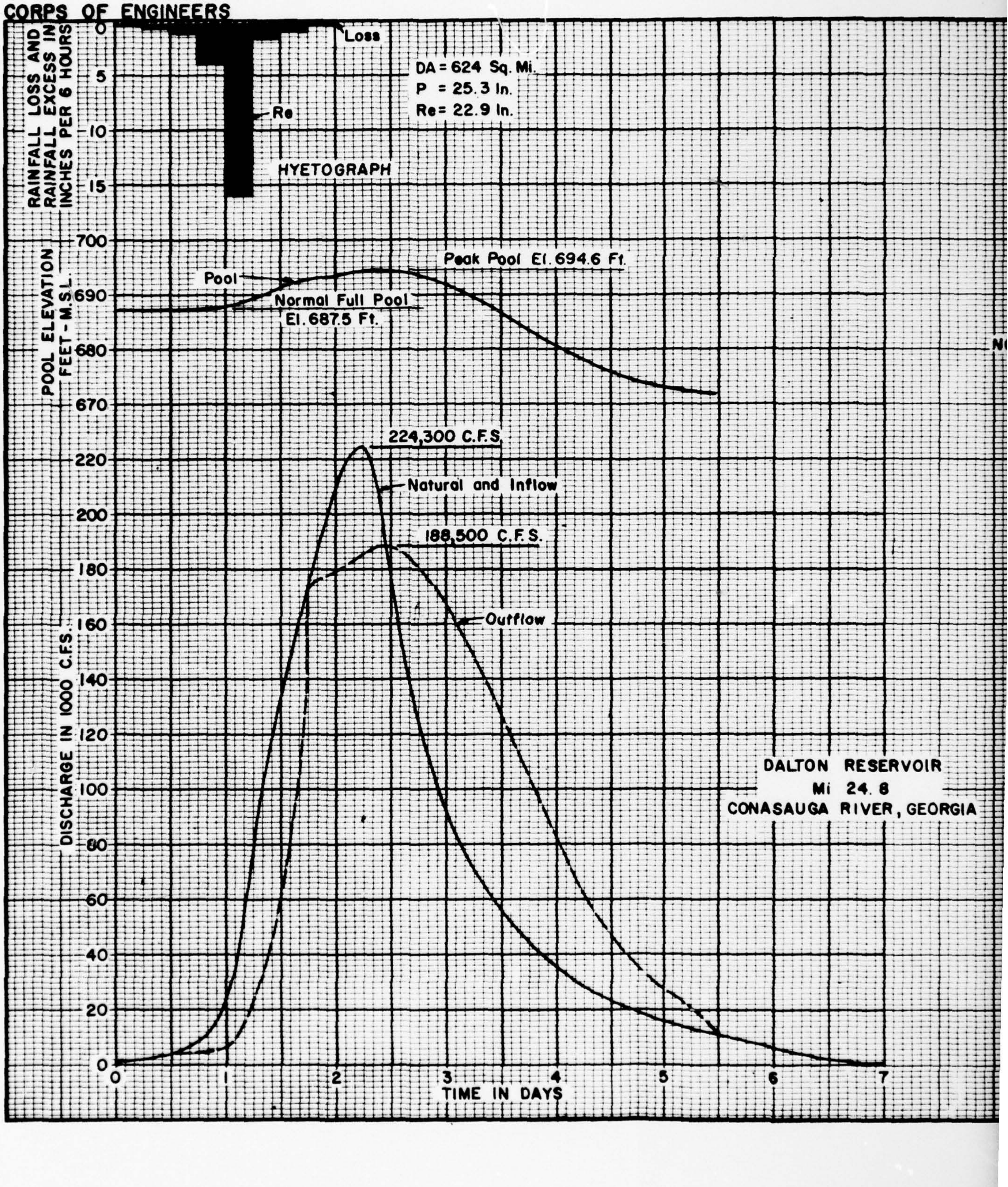

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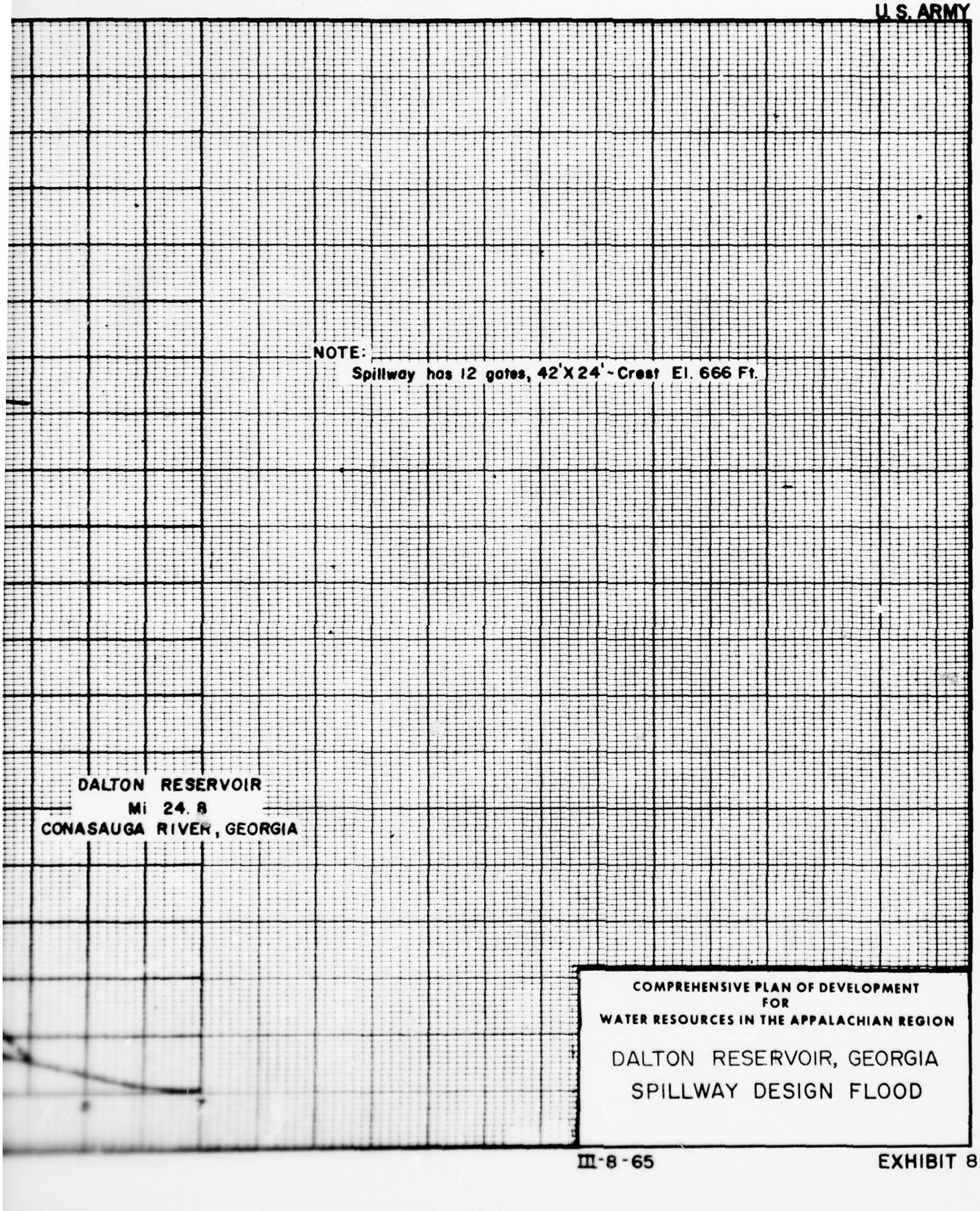

COMPREHENSIVE PLAN OF DEVELOPMENT
FOR
WATER RESOURCES IN THE APPALACHIAN REGION

DALTON RESERVOIR, GEORGIA
SPILLWAY DESIGN FLOOD

EXHIBIT 8-20

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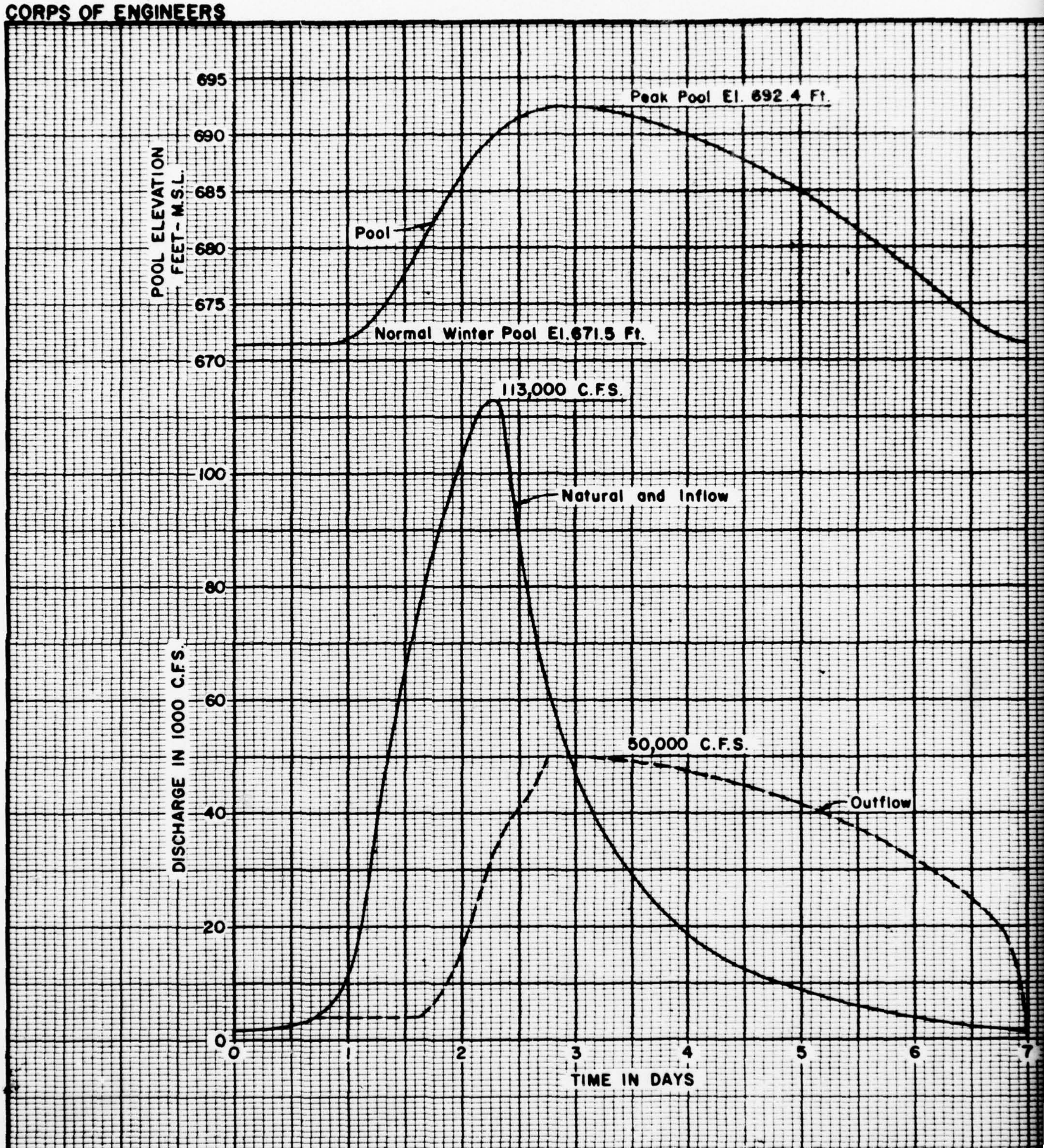

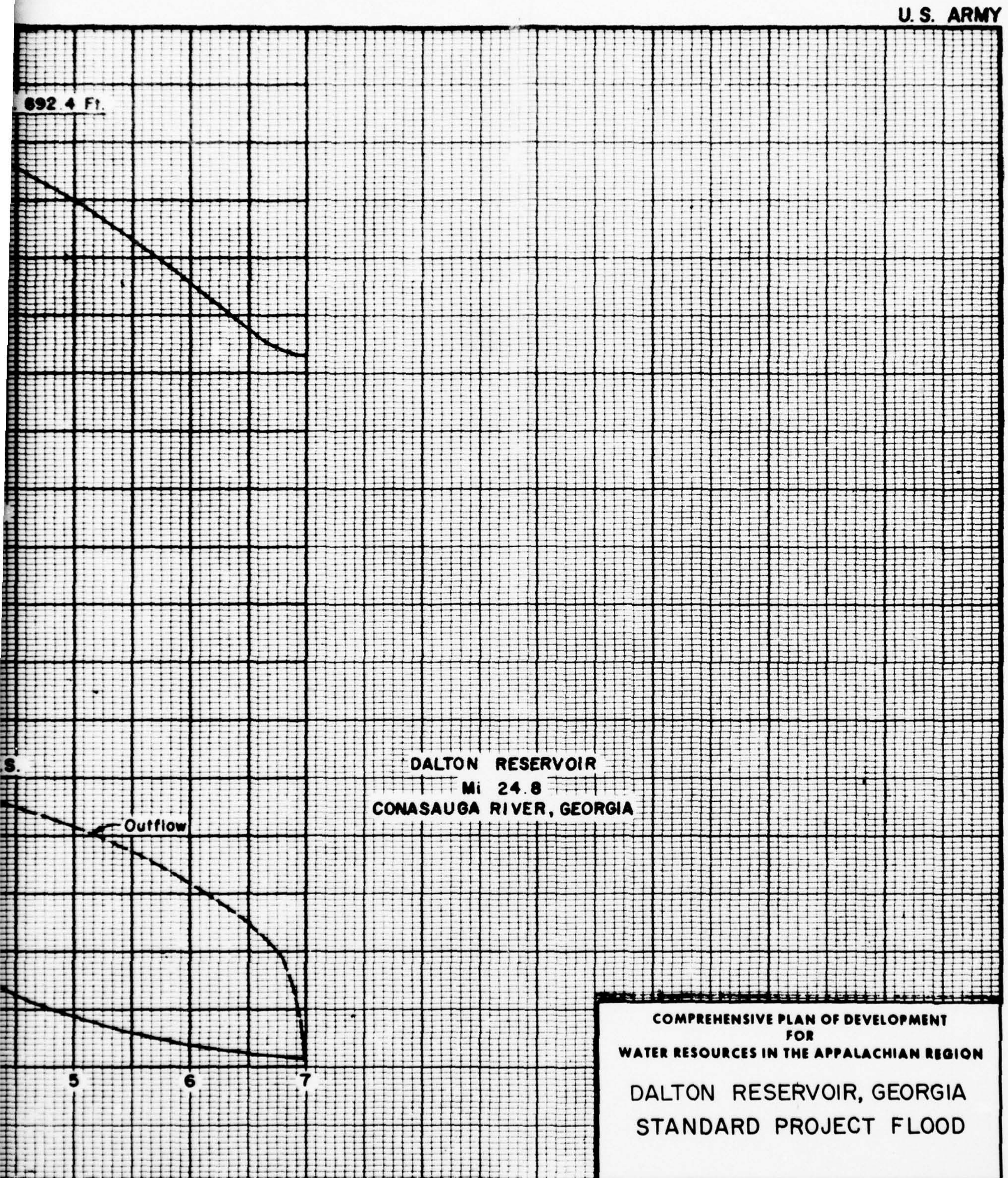

COMPREHENSIVE PLAN OF DEVELOPMENT
FOR
WATER RESOURCES IN THE APPALACHIAN REGION

DALTON RESERVOIR, GEORGIA
STANDARD PROJECT FLOOD

EXHIBIT 8-21

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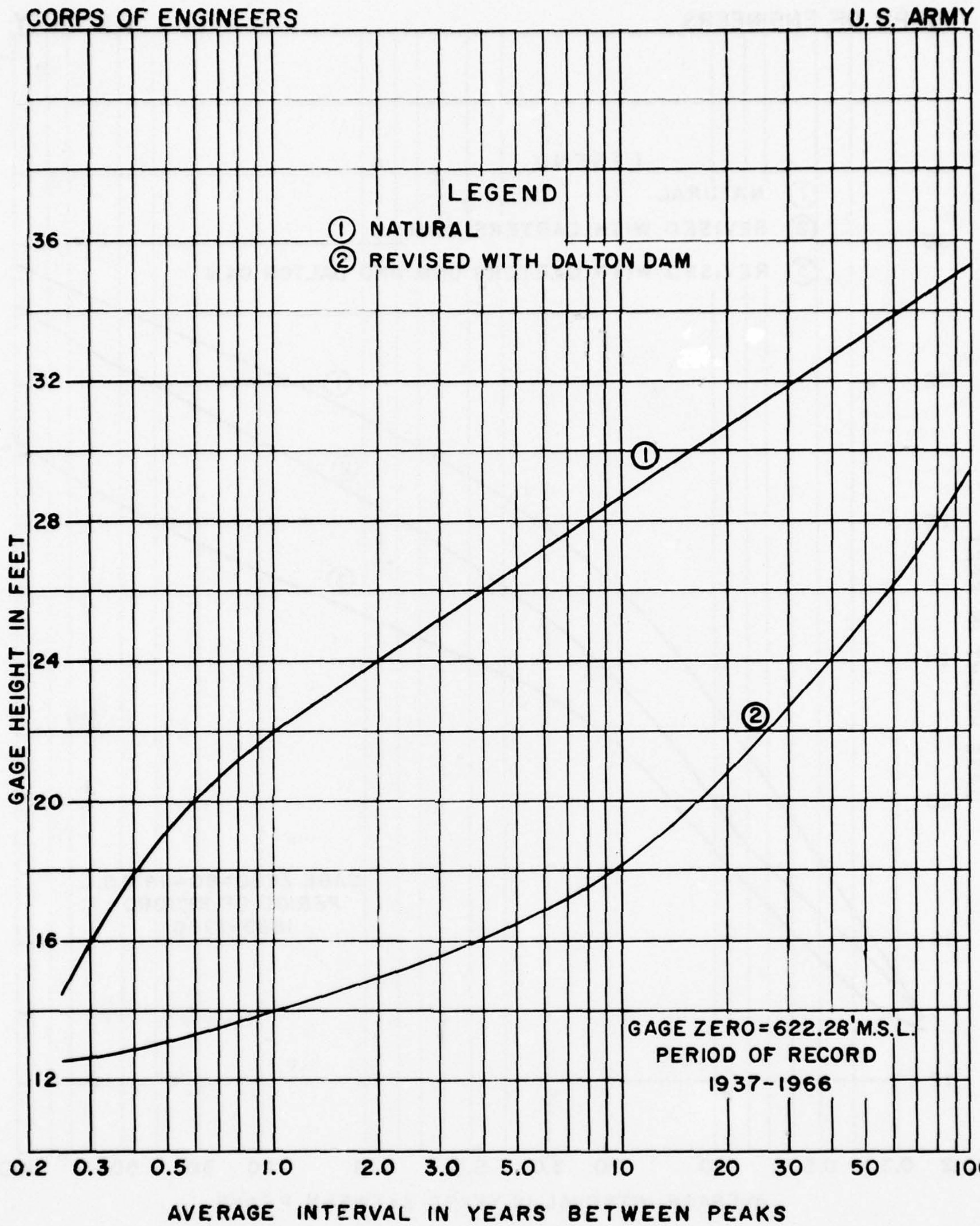
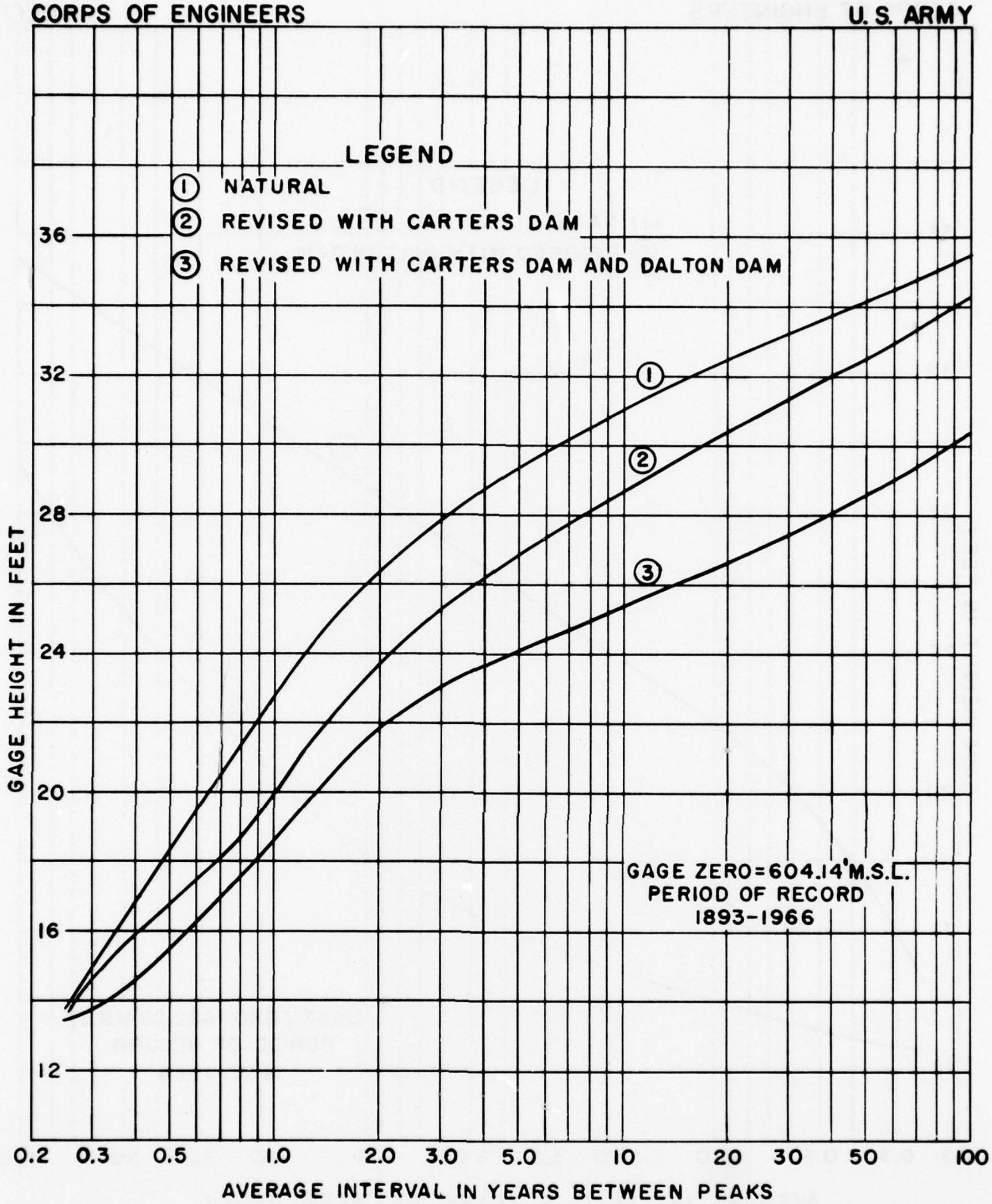


COMPREHENSIVE PLAN OF DEVELOPMENT
FOR
WATER RESOURCES IN THE APPALACHIAN REGION

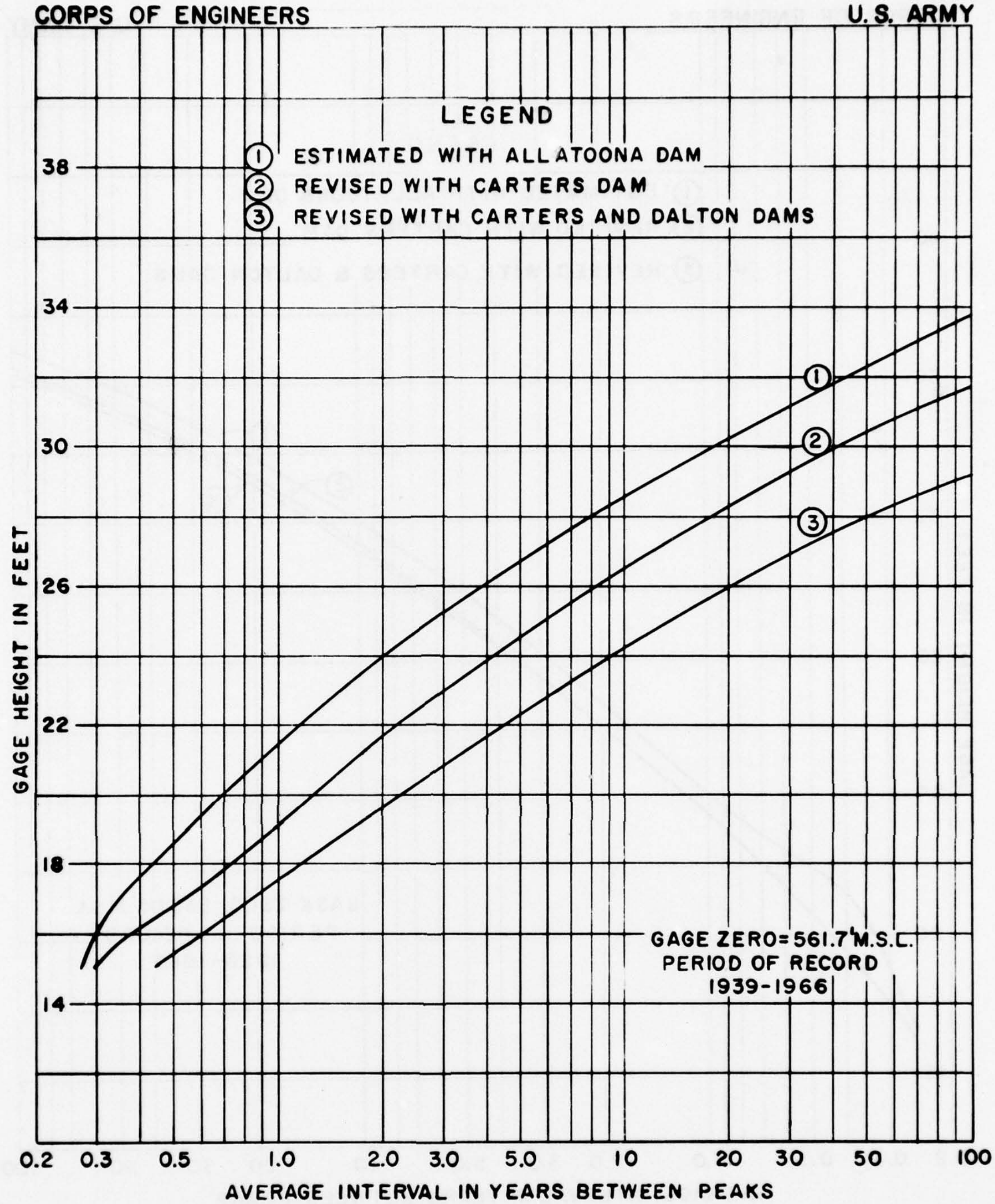
CONASAUGA RIVER AT TILTON, GA.
STAGE-FREQUENCY RELATIONSHIPS

EXHIBIT 8-22



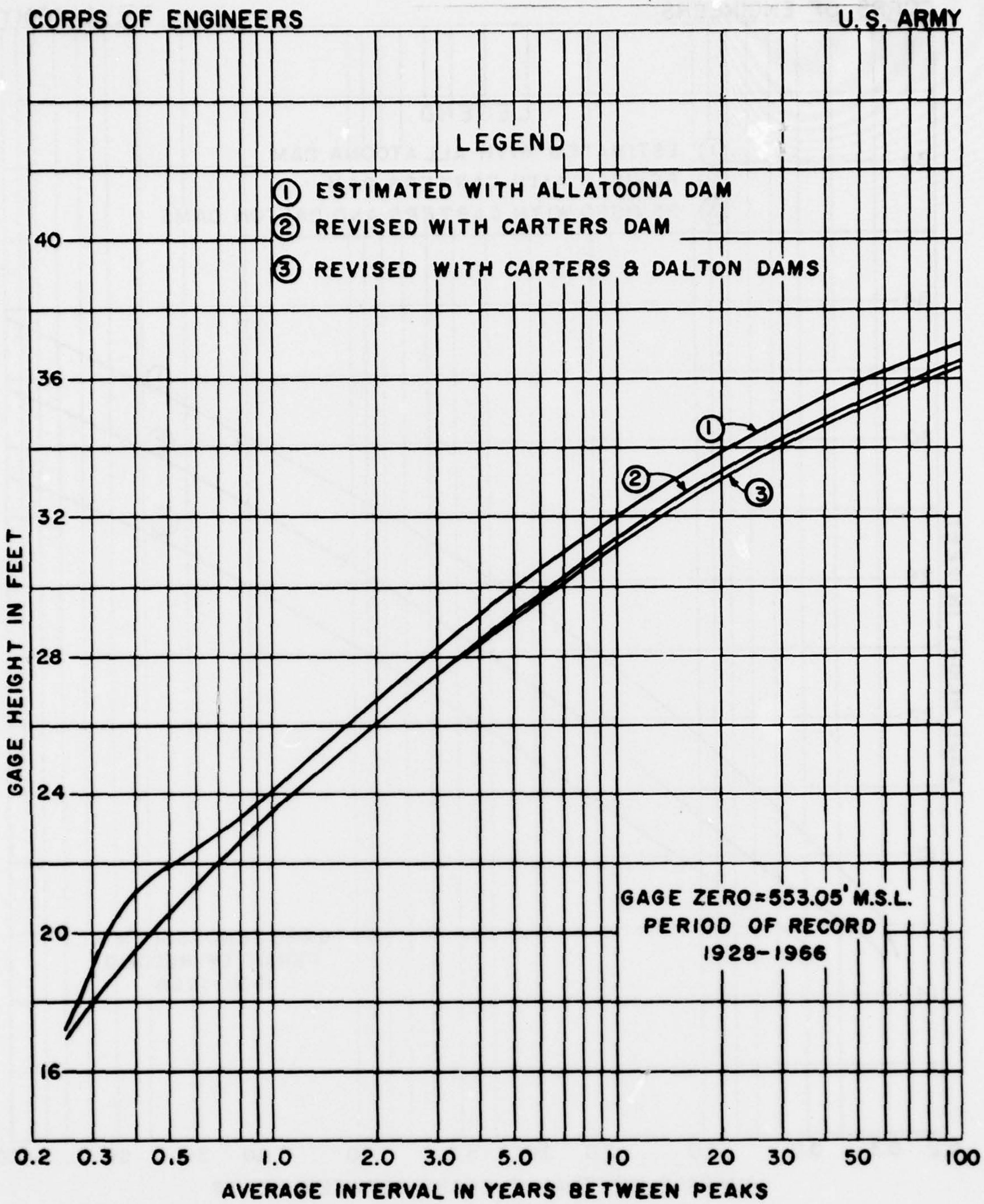
COMPREHENSIVE PLAN OF DEVELOPMENT
FOR
WATER RESOURCES IN THE APPALACHIAN REGION
OOSTANAULA RIVER AT RESACA, GA.
STAGE-FREQUENCY RELATIONSHIPS

EXHIBIT 8-23



COMPREHENSIVE PLAN OF DEVELOPMENT
FOR
WATER RESOURCES IN THE APPALACHIAN REGION
OOSTANAULA RIVER NEAR ROME, GA.
STAGE-FREQUENCY RELATIONSHIPS

EXHIBIT 8-24



COMPREHENSIVE PLAN OF DEVELOPMENT
FOR
WATER RESOURCES IN THE APPALACHIAN REGION
COOSA RIVER NEAR ROME (MAYOS BAR), GA.
STAGE-FREQUENCY RELATIONSHIPS

EXHIBIT 8-25

be sufficient to maintain at the Tilton gage the 7-day low flow occurring once in ten years estimated to be 95 cfs. During preconstruction planning preimpoundment conditions will be thoroughly investigated and the need for special facilities for selective withdrawal will be determined and provided if required. Due to the shallow nature of this reservoir it is expected that spillway gate and sluice operations can provide regulation for this purpose as well as those of the emergency drawdown nature.

Recreation

The reservoir could be filled in April to elevation 680 in 20 of the 29 years of record. In 25 of the 29 years, it could be filled to elevation 680 during April and May. For 2 of the years, it would take into the month of June to fill to that elevation; for 1 of the years, into July; and for the remaining year, into August.

Reservoir As Unit in System

A plan has not yet been formulated for integrating the Dalton Reservoir project into a system for controlling floods and abating pollution at downstream points. When Carters Dam, now under construction on the Coosawattee River, has been completed and Dalton Dam constructed, a system of coordinated operation of Carters, Dalton, and Allatoona Reservoirs will be established to the best interest of the localities concerned. As a result of flow release from the dam for water quality control purposes, a small amount of additional prime flow can be developed at downstream hydropower plants in the Coosa River. Benefits from this source are estimated to be $2,000 annually, however, they have not been assigned to the project at this time since it is the responsibility of the Federal Power Commission to evaluate and assess benefits under Section 10(f) of the Federal Power Act. The evaluation can be accomplished during preconstruction planning.

Hydrologic Network

A hydrologic network consisting of reporting precipitation gages, reservoir inflow gages, tailwater elevation gage, and a telephonic interrogating gage at the Tilton stream gage would probably have to be installed. The precipitation and inflow gages would be necessary for forecasting inflow into the reservoir, and the reservoir and downstream gages to determine flood releases and releases for maintaining water quality during low flow periods. Details will be worked out during design stage, and the gages will be located and installed in cooperation with the USWB and USGS.

Pertinent Data

Pertinent hydraulic and hydrologic data for Dalton Reservoir are summarized in table 8-9.

TABLE 8-9

PERTINENT DATA ON DALTON RESERVOIR, CONASAUGA RIVER, GEORGIA

General:		
Damsite	miles above rivermouth..	24.8
Drainage area above damsite	square miles..	624
Sediment retention capacity	acre-feet..	24,400
Maximum conservation pool elevation	feet above msl..	680.0
Maximum storage capacity for water supply and streamflow augmentation	acre-feet..	85,600
....do	watershed-inches..	2.57
Recreation pool elevation	feet above msl..	680
Reservoir area at elevation 680	acres..	8,650
Reservoir area at elevation 671.5	do....	5,050
Primary flood control pool elevations	feet above msl..	671.5-687.5
Primary flood control storage capacity	acre-feet..	131,000
....do	watershed-inches..	3.94
Induced surcharge pool elevations	feet above msl..	687.5-693.0
Induced surcharge storage capacity	acre-feet..	82,000
....do	watershed-inches..	2.5
Estimated natural streamflow at damsite for period, June 1937 - September 1966: 1/		
Mean discharge for 29-year period	cfs..	1,067
Minimum discharge:		
Daily (24 and 25 October 1954)	do....	62
Monthly (October 1954)	do....	76
Maximum discharge:		
Instantaneous (30 March 1951)	do....	26,500
Monthly (January 1947)	do....	5,947
Bankful discharge (approx. for downstream reach)	do....	4,000
Spillway design flood:		
Total average rainfall	watershed-inches..	25.3
Initial loss	do....	0
Average infiltration rate	inches per hour..	.05
Total rainfall excess	watershed-inches..	22.9
Base flow	cfs..	1,600
Estimated maximum natural flow at damsite	do....	224,300
Estimated maximum flow into reservoir	do....	224,300
Estimated maximum outflow	do....	188,500
Estimated peak headwater elevation	feet above msl..	694.6
Estimated peak tailwater elevation	do....	692.4
Standard project flood:		
Estimated natural flow at damsite	cfs..	113,000
Estimated maximum flow into reservoir	do....	113,000
Estimated maximum outflow	do....	50,000
Estimated peak headwater elevation	feet above msl..	692.4
Estimated peak tailwater elevation	do....	673.8
Flood volumes:		
Spillway design flood	watershed-inches..	23.6
Standard project flood	do....	12.1
14-25 January 1947	do....	8.3
11-23 December 1961	do....	7.3
28 January - 12 February 1957	do....	7.3

1/ From records for Tilton gage on Conasauga River.

11. GEOLOGIC

Surrounding Area Description

The project is located in Whitfield and Murray Counties, northwest Georgia, in the Valley and Ridge physiographic province. This province is part of the Appalachian Valley, which is a comparatively narrow belt of low-lying country extending from Canada to northern Alabama. The terrain consists of parallel valleys, separated by steep or well-rounded ridges. Lowland areas are about 640 to 700 feet msl. The highest ridges reach an altitude of about 1,185 feet.

Area Geology

The area is underlain by well-indurated rocks that range from Cambrian through Ordovician in age. The oldest exposed rocks are of Cambrian age. Two formations of this age outcrop in the area. The older, the Rome formation, is generally interbedded siltstone, shale, and sandstone. The unit is primarily a shale containing thin stringers of very fine grained sandstone. The other Cambrian unit is the Conasauga formation. It is primarily a limestone unit with interbedded siltstone and shale. The Knox group of the Ordovician and Cambrian Systems outcrops between the exposures of the Conasauga formation in the study area. Units of the Knox group are composed of dolomite and dolomitic limestone.

The rocks in the area of study are highly folded. The strike of the outcrops is generally northeast, and the geologic structure is mainly a series of synclines with major fault zones traversing the area parallel to the outcrops.

General Project Description

The Dalton Dam site is located approximately 6 miles southeast of Dalton, Ga., on the Conasauga River, 24.8 miles above that stream's confluence with the Coosawattee River.

The Valley and Ridge province in the project area is characterized by broad, relatively low valleys, with narrow separating ridges. In the project area, the abutment hills extend to about elevation 740. On the right bank, between elevation 650 at the riverbank and the 670 contour, the flood plain is about 1,000 feet wide. On the left bank, there is no discernible flood plain.

Site Geology

The site is underlain by the Conasauga formation of Cambrian age, which is gray shale with variable amounts on interbedded limestone. Outcrops observed in the area exhibited a dip of between 45° and 60° E., which is upstream. (See exhibit 8-26 for geologic section along dam axis.)

Subsurface Investigations

There have been no previous geologic investigations at this site. Present investigations consisted of a field reconnaissance of the site and foundation explorations along the proposed centerline of the dam.

Foundation explorations consisted of drilling two 5 1/2-inch-diameter holes and retrieving 4-inch-diameter core samples. Split-spoon samples of overburden were obtained at the two core holes. The location and the logs of the holes are shown on exhibit 8-27.

Foundation Determinations

As indicated by the logs, the thickness of overburden was relatively uniform; however, there is a considerable variation in the amount of weathered rock above suitable foundation material. The cores indicated about the same dip as that observed in the area, with one hole having two contorted zones. All rock below the sound rock line is hard, and the orientation of the bedding is favorable to the stability of the dam as planned. The bearing capacity and the shearing strength of the sound rock far exceed requirements. Curtain grouting and a chimney drain would provide seepage control.

Reservoir Conditions

A study of available geologic maps and investigations concerning the limestone layers have indicated no solution cavities which would be of importance to the project. Leakage in the reservoir is not expected to be significant, and no treatment is proposed at this time.

Construction Materials

The embankment would be an impervious fill requiring approximately 220,000 cu. yd. of compacted fill, 6,300 cu. yd. of riprap, and 2,400 cu. yd. of crushed-stone bedding. It is anticipated that the required quantities could be obtained in the vicinity of the project.

No detailed borrow investigations were performed at this time due to the limited scope of the study. From past experience in the area, no problems are anticipated.

Aggregate is available from commercial sources at Dalton and Calhoun, Ga. Water for mixing is available at the project site from the Conasauga River.

Mineral Resources Affected

A reconnaissance of the Dalton Reservoir area by the Bureau of Mines found that construction of the project at the selected location would not involve inundation of significant mineral deposits. The conslusions of the BOM report are reprinted below:

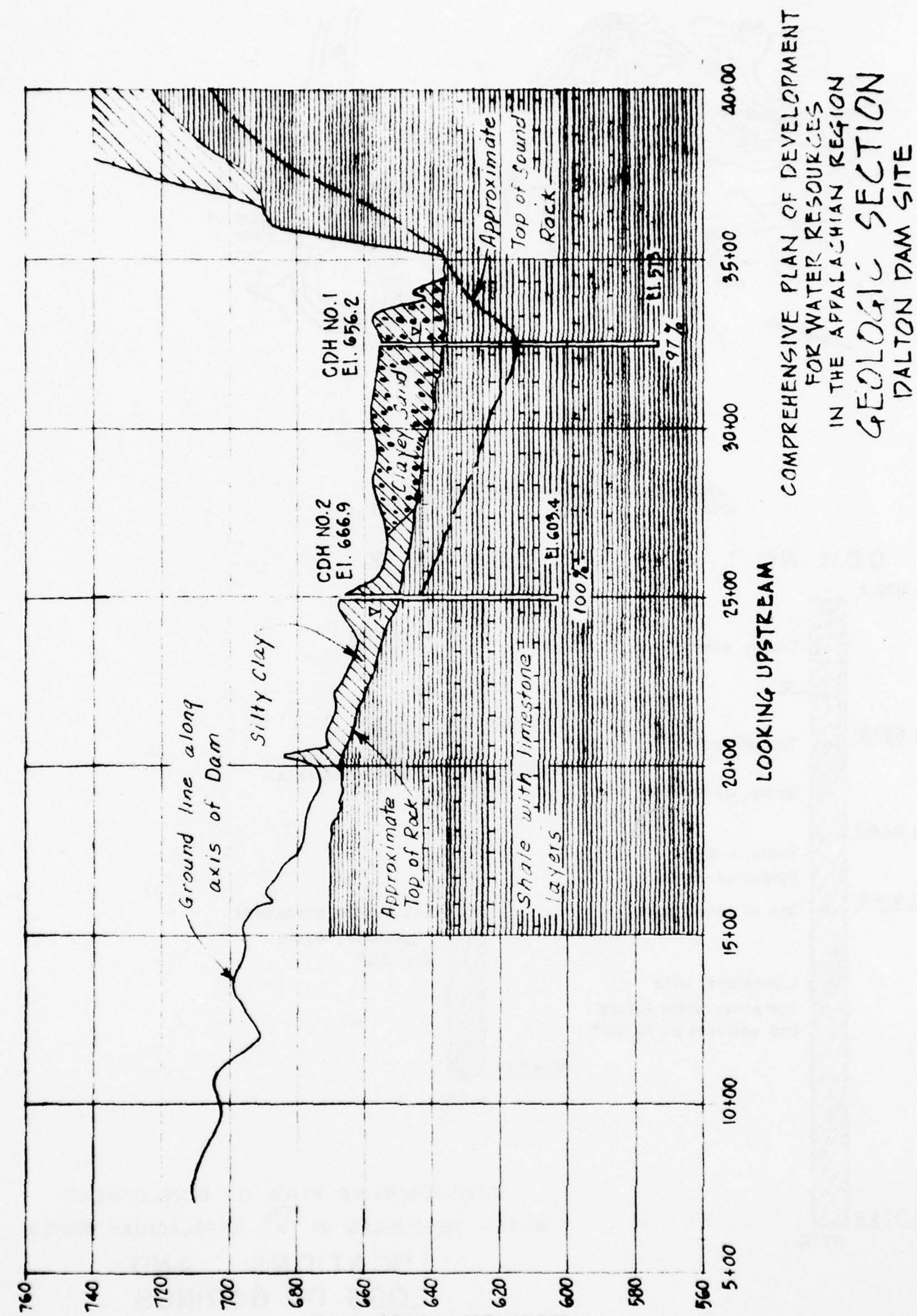


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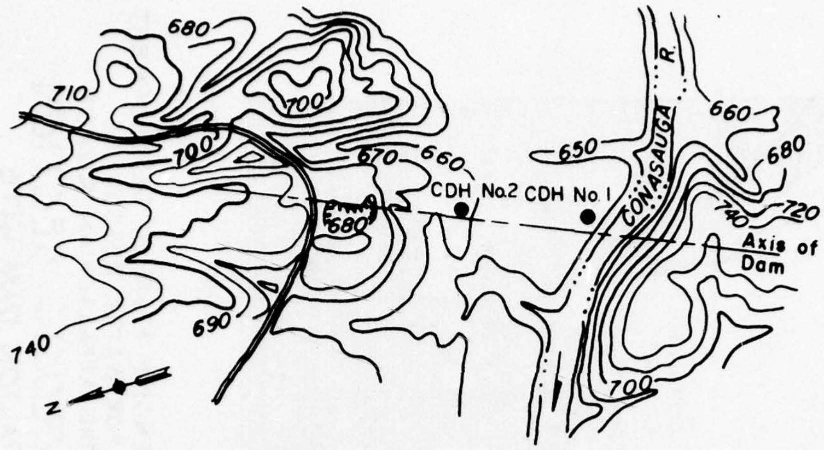
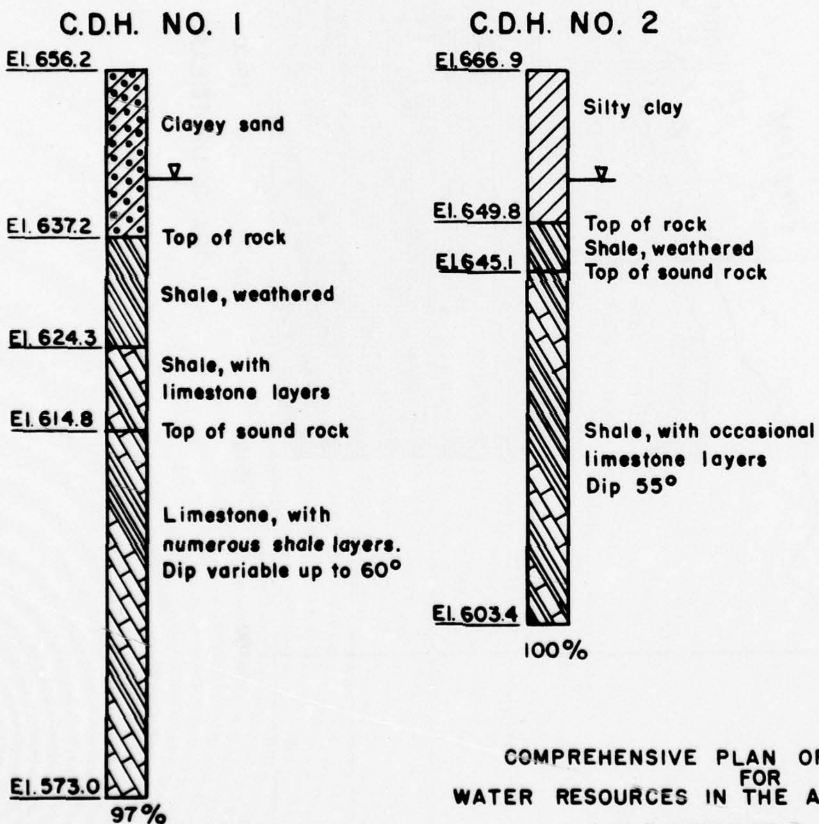
Exhibit 8-86



PLAN

SCALE IN FEET

1000 0 1000 FT.



COMPREHENSIVE PLAN OF DEVELOPMENT
FOR
WATER RESOURCES IN THE APPALACHIAN REGION

LOCATIONS AND LOGS OF BORINGS
DALTON DAM SITE

Exhibit 8-27

"The Dalton Rock Products Company limestone quarry might be indirectly affected by the proposed reservoir because the haulage and access roads might be inundated or impaired. Preliminary estimates show the present value of the quarry, preparation plant, and limestone reserves to be more than the cost of reconstruction and relocation of parts of one existing haulage and access road. Direct conflict between the water resources project and the Dalton Rock Products Co. quarry could develop in the future if the quarry is extended. Significant quantities of water could seep into the quarry even though available information indicates that rock in and near the quarry does not readily transmit water."

Conclusion

The project is entirely feasible from a geologic standpoint.

12. STRUCTURAL

The structural design features presented in this report for the Dalton Reservoir project are of a preliminary nature and are based on the applicable portions of the Corps' engineering manuals for civil works. The dam would consist of a gated spillway structure flanked by concrete nonoverflow sections which, in turn, would be tied to high ground by earthfill sections. The dam would have a total length of 2,394 feet, and its maximum height would be 85 feet above streambed. Twelve tainter gates (each 42 feet long and 24 feet high) on a broad-crested concrete sill (crest at elevation 666) and a 5- by 8-foot sluice (intake invert at elevation 635) would serve to regulate the outflows from the reservoir. A broad-crested weir was selected for the spillway crest because flows in excess of 38,000 cfs would be affected by tailwater levels and would not follow an ogee crest shape. The sluice would be provided in the spillway section for river diversion during cofferdam closure and for releases during minor floods and non-flood periods. A layout of the proposed structures is given in exhibit 8-11 (page III-8-37).

13. RELOCATIONS

The relocations level for the 50-year flood in the reservoir, elevation 689.6, requires that 9.6 miles of Federal and State highways be raised above this level. Another 7.5 miles of county roads also would be raised. Governing safety standards require these highway and road modifications. Dalton has rail service, but there are no railroad lines within the potential reservoir area. The relocation of cemeteries would not be involved with this project based on collected data during the investigation. About 24.6 miles of electric power and telephone lines, 3.9 miles of gas and water lines, as well as some power, gas, and water facilities would require relocation or modification. A Georgia Power Company substation, a natural gas dispatch station and Dalton's raw water intake structure on the Conasauga River would be involved.

AD-A041 394 CORPS OF ENGINEERS CINCINNATI OHIO F/G 8/6
DEVELOPMENT OF WATER RESOURCES IN APPALACHIA. MAIN REPORT. PART--ETC(U)
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Insofar as practicable these relocations will be made commensurate with the Outdoor Recreation Plan of Development for Georgia. A map of the reservoir area with proposed relocations is shown in exhibit 8-10 (page III-8-35).

The NPS has furnished the following information on historical and archeological sites of the project area and they are summarized in appendix F.

Two important historical sites are located near the project area and are preserved by the Georgia Historical Commission. The Chief Vann House will be on the very edge of the reservoir near Spring Place. New Echota, established in 1826 as the "Capitol of the Creek Nation," lies south of the dam and is near Calhoun. The sites of several structures associated either with the Van House or with nearby 1801 Moravian Mission are located with the projected reservoir. Those sites include the Vann Mill, The Vann Trading Post (exact location not yet known), and the Moravian brick kiln located near the Vann House.

General archeological information on the proposed reservoir area is meager. A field survey produced only two sites; however, field conditions at the time were not favorable for site survey. When the project is authorized, additional survey and a program of salvage, expected to cost $10,000, of both the archeological and historical information will be necessary.

14. REAL ESTATE

The proposed guide taking line is the 694 contour or a line located 300 feet horizontally from the 687.5 contour, whichever would result in a greater project area. The 694 contour is 6.5 feet above the normal full pool and acquisition to this elevation would provide one foot in reservoir level above the induced-surcharge pool elevation. The total joint-use land area thus proposed for acquisition would be 17,500 acres, including 75 acres for the dam and spillway structures. An additional 2,000 acres above the guide taking line are to be acquired for intensive recreational development. Under project conditions, the downstream fishery is expected to be greatly improved, and 12 acres are to be acquired below the dam for fisherman access and boat launching purposes. To offset the loss of hunting opportunities which would result from inundating the lands in the reservoir area, it is proposed that another 4,200 acres suitable for upland game and waterfowl habitat be acquired. All land, about 23,700 acres, is to be purchased in fee.

Half of the proposed project area is cleared land. Areas that would have to be cleared contain 20 acres of commercial and 275 acres of residential sites. The reservoir would be adjacent to urban developments along the eastern city limits of Dalton and the western limits of Spring Place, Ga.

Appraisal of the property involved was based on a preliminary field inspection of the area, examination of recent aerial photographs, analyses of recent sales of comparable tracts, and value data from active dealers in farm property in the area. Per acre values assigned to specific-use lands area is somewhat higher than that for wildlife mitigation area since the latter would be located in the more isolated areas away from good access and the use of these lands is not presently equivalent to that of the areas designated for specific-use recreation purposes. Severance payments are expected to be relatively small. There are no known major mineral resources which would have to be acquired, and mineral rights in this area are usually included in land sales.

15. RECREATION FACILITIES

The Bureau of Outdoor Recreation inventoried the water and land areas available for outdoor recreation and indicated a present and future unsatisfied demand for water-associated and other outdoor recreation opportunities in the related recreation market area. The Bureau concluded that present water areas and those to become available in the near future would be adequate for boating until 1975. Similar demand for camping in the area could be met on available lands suitable for the activity. However, these and other recreation activities are expected to result initially in 368,000 annual user days and by 2020, in 2,180,000 annual user-days at Dalton Reservoir. There is therefore an immediate need for the recreation facilities planned for the project. Besides the estimated general recreation attendance, the project's waters, lands, and facilities would support an annual average of more than 204,000 days of fishing and hunting, including 5,135 angler-days at dam tailwaters and points farther downstream.

The anticipated day load for initial and ultimate attendance was determined by the following formula:

$$\text{Design Load} = \frac{Acd}{wt}$$

Where:

DL = The number of people expected to use a project or facility at any one time on a normal summer Sunday.

A = Estimated annual attendance 368,000 initial and 2,180,000 ultimate.

c = Percent of attendance that will visit project during recreation season (50 estimated).

d = Percent of weekly attendance expected on a normal summer Sunday (40 estimated).

w = Number of weeks in recreation season (13).

t = Turnover rate of daily use of facility (1.5).

The design load for fishing was based on the annual attendance provided by the Bureau of Sport Fisheries and Wildlife which was based

on experience at projects in the Mobile District. On this basis parking areas for 725 cars and 365 boat trailers are included.

The initial recreation development of lands adjacent to Dalton Reservoir would consist of three areas intensively developed for general outdoor recreation, four additional locations primarily intended for access to the reservoir pool, and six access areas to the tailwaters below the dam. At the ten strategically located access points, the facilities would be limited mainly to parking areas, boat launching ramps, and some picnic units. At the three primary recreation areas, located on ridges which would become peninsulas in the reservoir, facilities for swimming, picnicking, camping, hiking, boating, and sightseeing would be provided, including swimming beaches and bathhouses, picnicking and camping units, walkways, hiking trails, boat launching ramps, parking areas, utilities, and appropriate administration buildings as well as sanitary facilities. Existing State and county roads which would be severed by the reservoir would provide ready access to all seven general recreation and fisherman access areas and, together with a network of new circulation roads, would suffice to distribute adequately recreationists and other visitors.

In their analysis of the recreation facilities needed for the project, the U.S. Fish and Wildlife Service concluded that six 1-acre access sites should be furnished for fishermen and general recreationists at or near existing road crossings on the Conasauga River reach downstream from the dam. To help minimize interference with normal cross-river or parallel-river traffic from users of these access sites, the latter's size would be larger - 2 acres - under the proposed project. One of the sites would be just downstream from the dam, while the exact location of the remaining five would be determined in preconstruction planning.

It is expected that the reservoir would spawn "rough" fish species which would encroach during normal flow conditions on Mill and Holly Creeks in Murray County and the headwaters of the Conasauga, which are good trout-producing streams. It is estimated that 10,800 man-days of trout fishing valued at $32,400 annually would be lost unless conservation measures are provided. It is therefore planned to construct barriers in the affected streams, upstream from the flood pool limits of the reservoir. These barriers would consist of creosoted piling, timbers, and rock placed so as to cause a small differential in water surface levels which would prevent "rough" fish species from encroaching on the trout waters. These measures would cost about $310 annually.

Since there would be only 5,500 acres of project lands suitable for wildlife habitat above the normal summer pool level, the acquisition of an additional 4,200 acres is planned for partial mitigation of loss of wildlife habitat and hunting opportunities due to project installation. The added land, together with other project lands near the head of the reservoir and on the Mill Creek and Holly Creek areas of the impoundment, would form a continuous, 6,300-acre tract that would be intensively managed for waterfowl and other game hunting. Resultant opportunities

for small-, upland-, and big-game hunting would produce an average annual benefit of $25,600, while opportunities for waterfowl hunting would have an average annual benefit value of another $3,100. The annual charges for acquiring mitigation lands for $525,000 and providing facilities thereon for $46,000 would be: (a) $19,400 for interest and amortization; and (b) $6,000 for operation and maintenance.

Project lands and their uses are discussed in paragraphs 2, 14 and 15 of this report and a summary of the information related to reservoir recreation and fishing is given below:

Project Lands	Area in Acres	
Total project	23,700	
a. Project operation		17,500
b. Wildlife mitigation, proposed acquisition		4,200
c. Recreation, specific-use		2,000
Joint-use for project operations	8,850 1/	
Recreation and fishing, reservoir area	5,600	
a. Specific-use		2,000
b. Joint-use		4,600 2/
Wildlife mitigation	9,700	
a. Proposed acquisition		4,200
b. Joint-use		5,500 2/

1/ The land between elevation 680 (summer pool) and elevation 694 (taking line).

2/ Since the sum of these lands exceeds the joint-use land for project operations, some sharing or overlap of uses will be required.

During preconstruction planning for this reservoir a detailed evaluation of economic justification for the proposed wildlife mitigation lands and facilities of the project will be made and a recommendation on their inclusion in the project plan will be made before funding. This determination for justification will be based on the interest rate applicable to project planning at that time.

Consideration should be given during preconstruction planning of the Dalton Reservoir project to developing a joint historical and recreational area near Spring Place, Ga., in connection with several historical sites and structures related to the Moravian Mission and the Creek Nation.

Other considerations for the preservation of the natural environment of the project area will be made during preconstruction planning when additional investigation of these aspects will determine fully their needs.

Due to the nature of the reservoir and its environs, non-Federal administration of the recreation development would be appropriate. The State of Georgia is expected to designate an appropriate agency to fulfill the responsibilities for: non-Federal participation in the costs for the recreation facilities; cooperation in the preconstruction planning of the development to insure its compatibility with other elements of the Georgia State-wide Outdoor Recreation Plan; cooperation in the construction of the facilities; and, administration of the entire recreation development.

The areas of initial development for recreation are shown in exhibit 8-10 (page III-8-35). A detailed account of lands, facilities, and costs for general recreation and fish and wildlife enhancement and mitigation is presented in table 8-10. Annual charges, activity-days, and benefits are shown in table 8-11.

TABLE 8-10

GENERAL RECREATION AND FISH AND WILDLIFE ENHANCEMENT AND MITIGATION

DALTON RESERVOIR DETAILED ESTIMATE OF FIRST COST

	Unit	Unit cost	Initial development Quantity	Initial development Amount	Future development Quantity	Future development Amount	Total development Quantity	Total development Amount
Specific-use lands:								
General recreation areas	Acre	$140	2,000	$280,000			2,000	$280,000
Fishing (downstream)	Acre	140	12	1,700			12	1,700
Acquisition cost	L.S.			28,000				28,000
Contingencies				40,300				40,300
Total				350,000				350,000
General recreation facilities:								
Picnic units	Each	1,910	28	53,500	140	$267,400	168	320,900
Picnic shelters	Each	10,500	1	10,500	6	63,000	7	73,500
Camping units	Each	1,360	112	152,300	559	760,200	671	912,500
Roads:								
Access	Mile	55,000	4	220,000	4	220,000	8	440,000
Circulation	Mile	50,000	6	300,000	6	300,000	12	600,000
Anglers' parking and other:								
At reservoir	Job	-	-	219,300	-	-	-	219,300
Below dam	Job	-	-	161,000	-	-	-	161,000
Boating units	Each	18,600	6	111,600	29	539,400	35	651,000
Water supply units	Each	1,200	50	60,000	248	297,600	298	357,600
Sanitation units	Each	9,500	12	114,000	58	551,000	70	665,000
Landscaping	Job	-	-	7,200	-	35,900	-	43,100
Trails	Mile	5,000	7	35,000	44	220,000	51	255,000
Swimming beach	Sq. ft.	1.25	33,500	41,900	167,500	209,400	201,000	251,300
Signs and markers	Job	-	-	1,200	-	6,200	-	7,400
Buildings, grounds, and utilities	Job	-	-	100,000	-	100,000	-	200,000
Contingencies				242,500		539,900		782,400
Engineering, design, supervision, and administration				320,000		690,000		1,010,000
Total				2,150,000		4,800,000		6,950,000
Grand total, specific cost				2,504,000 1/		4,800,000		7,304,000 1/
Joint-use lands:								
Wildlife mitigation tract	Acre	100	4,200	420,000			4,200	420,000
Acquisition cost	L.S.			42,000				42,000
Contingencies				63,000				63,000
Total				525,000				525,000
Wildlife facilities:								
In mitigation area:								
For mitigation (joint-cost)	Job	-	-	22,400	-	-	-	22,400
For waterfowl enhancement (non-Federal)	Job	-	-	2,800	-	-	-	2,800
Rough-fish barriers (mitigation)	Job	-	-	6,800	-	-	-	6,800
Contingencies				8,000				8,000
Engineering, design, supervision, and administration				10,000				10,000
Total				50,000				50,000
Grand total, wildlife mitigation and enhancement cost				575,000				575,000

1/ Includes $4,000 for waterfowl enhancement, which is the $2,800 cost listed below with an added allowance for contingencies, E&D, and S&A.

otal development	
ntity	Amount
2,000	$280,000
12	1,700
	28,000
	40,300
	350,000
168	320,900
7	73,500
671	912,500
8	440,000
12	600,000
-	219,300
-	161,000
35	651,000
298	357,600
70	665,000
-	43,100
51	255,000
01,000	251,300
-	7,400
-	200,000
	782,400
	1,010,000
	6,950,000
	7,304,000 1/
4,200	420,000
	42,000
	63,000
	525,000
-	22,400
-	2,800
-	6,800
	8,000
	10,000
	50,000
	575,000

n added allowance

2

TABLE 8-11

GENERAL RECREATION AND FISH AND WILDLIFE ENHANCEMENT, DALTON RESERVOIR

TOTAL COSTS AND ANNUAL CHARGES, ACTIVITY-DAYS, AND BENEFITS

	Initial increment	Future increment	Total	Future increment discounted	Total with future increment discounted
First cost:					
Specific-use lands	$350,000	0	$350,000	0	$350,000
(Market value of lands - amount included in line above)	(281,700)	0	(281,700)	0	(281,700)
Specific-use facilities	2,154,000	$4,800,000	6,954,000	$2,425,000	4,579,000
Total, first cost	2,504,000	4,800,000	7,304,000	2,425,000	4,929,000
Investment:					
Total first cost	2,504,000	4,800,000	7,304,000	2,425,000	4,929,000
Interest during construction - 3.25% for one-half of 4-yr. construction period, 6.5%	163,000	0	163,000	0	163,000
Total, investment	2,667,000	4,800,000	7,467,000	2,425,000	5,092,000
Annual charges:					
Interest on investment	87,000			79,000	166,000
Amortization of investment	3,000			3,000	6,000
Operation and maintenance 1/	112,000			183,000	295,000
Major replacements	22,000			20,000	42,000
Adjustment for net loss of land productivity: $281,700x(0.05-0.0325)	5,000			-	5,000
Loss in hunting opportunities	4,000			-	4,000
Total, economic charges	233,000			285,000	518,000
Total, financial charges	224,000			285,000	509,000
Annual activity-days:					
General recreation	368,000	1,812,000	2,180,000		
Fishing, stream and reservoir	197,000	-	197,000		
Hunting, all categories	7,700	-	7,700		
Total, activity-days	572,700	1,812,000	2,384,700		
Annual benefits:					
General recreation	$460,000	$2,265,000	$2,725,000		$1,762,000
Fishing	193,000	-	193,000		193,000
Hunting, waterfowl	3,000	-	3,000		3,000
Total, benefits	656,000	2,265,000	2,921,000		1,958,000

1/ $6,000 by State of Georgia, a joint cost for management of wildlife mitigation units, are not included.

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SECTION IV - COST ESTIMATES

16. PROJECT

The total first cost of constructing the Dalton Reservoir project is estimated to be $44.3 million. This includes $39.5 million for the dam and reservoir with initial development for recreation and $4.8 million for a future increment of recreational facilities.

Estimates of first costs for the dam and reservoir as well as associated facilities include costs of construction, contingencies, engineering and design, and supervision and administration. Construction costs were based on detailed layouts shown on exhibit 8-11 (page III-8-37) and design considerations discussed in section III. Unit prices for the cost estimates are based on prices for similar work performed in nearby areas and are adjusted to July 1967 price levels. Contingency allowances amount to about 15 percent of the cost for lands, damages, resettlement, relocations, reservoir preparation, and recreation facilities and 25 percent of the construction costs of the dam and appurtenances. Table 8-12 summarizes the first costs for Dalton Reservoir and associated facilities. Detailed estimates of project first costs are shown in table 8-14.

Total investment costs and annual financial charges were developed on the basis of data presented in the first cost estimates. Investment costs are the first costs plus interest on the latter over the period of construction. The amount of interest was determined based on an annual rate of 3.25 percent and a construction period of 4 years. Since the construction period for the future recreational facilities was assumed to be less than 2 years, the investment cost for those facilities equals the first costs. Average annual charges were computed for the gross investment using the current Federal interest rate of 3.25 percent and an amortization period of 100 years. Operation and maintenance charges for the proposed developments are based on current expenditures for similar projects and the cost of major replacement items is included where applicable. Financial annual costs are summarized in table 8-13. Detailed estimates of the annual charges are shown in table 8-15 (page III-8-95).

17. DEVELOPMENTAL

Area Development Plan

To provide a basis for making preliminary cost and investment estimates, a master development plan was prepared for an orderly future growth in the Dalton area. This plan, shown as exhibit 8-28: Generalized Land Use and Thoroughfare Plan, depicts the zones for potential industrial development, the location of commercial and service areas, and the space set aside for residential and recreational use. Included is also a traffic circulation plan, which sets the location and improvements of highways to serve the future development in the area. A similar plan for Whitfield County by the Coosa Valley Area Planning and Development Commission served as groundwork for the proposed plan.

The development plan is composed of three elements:

Land use plan - a proposed areal distribution of industrial, residential, and commercial land use.

Public facilities and utilities plan - a proposed program for expansion of existing facilities and construction of new ones to meet adequately the projected demand generated with the proposed land use plan.

Transportation plan - a highway system conceived to serve effectively the area's development expected under the land use plan.

It should be noted that the plan as shown in exhibit 8-28 is designed not only to accommodate the project growth resulting from the reservoir project but also growth induced by other future public investments in the area. Other future public investimants will include those funded by ARC in accordance with the objectives of the Georgia Development Plan for FY 1969 and FY 1970. These broad areas of investment were identified in the plan: Education, college and vocational education; Health, especially health personnel and health programs; and, Urbanization, including transportation, sanitation and power. As identified in the plan, the Dalton area is a primary growth center located adjacent to I-75 corridor on the segment Atlanta, Georgia-Chattanooga, Tennessee. However, estimates of investment and costs of facilities presented in the report are only for development elements which would be directly related to the reservoir project. These estimates were phased by decade to the year 2020, and a summary of project-induced investments is provided in the last part of this paragraph.

Locational Advantages

Studies of the Dalton area revealed the following prime locational advantages for the particular classes of industry which would form the basis for the projected industrial development:

a. Dalton is the center of the world's tufted-textile industry, with 60 percent of all American-made tufted carpets being manufactured within 50 miles of the city. About 95 percent of the manufacturing plants were founded by local citizens, and 85 percent are under local control.

TABLE 8-12
SUMMARY OF CAPITAL COSTS, DALTON RESERVOIR, GEORGIA

(July 1967 prices)

No.	Item	Cost (1,000) dol.)	Cost with indirect costs distributed (1,000 dol.)
1	Lands and damages	8,700	8,700
2	Relocations	14,850	17,450
3	Reservoir	1,090	1,280
4	Dam and appurtenances	7,860	9,240
5	Recreation:		
	Initial development	1,830	2,150
	Future increment	4,110	4,800
6	Buildings, grounds, and utilities	400	470
7	Permanent operating equipment	140	160
8	Wildlife mitigation and enhancement	40	50
9	Engineering and design	3,039	-
10	Supervision, inspection, and overhead	2,241	-
	Total, estimated project first cost	44,300	44,300
	Less future recreation increment		4,800
	Total, estimated initial first cost		39,500

TABLE 8-13
SUMMARY OF FINANCIAL ANNUAL COST, DALTON RESERVOIR, GA.

(July 1967 prices)

No.	Item	Amount (1,000 dollars)
1	Interest on gross investment	1,446
2	Amortization of gross investment	61
3	Maintenance and operation	391
4	Major replacements	48
	Total	1,946

TABLE 8-14
DETAILED COST ESTIMATE, DALTON RESERVOIR, GA.

(July 1967 prices)

Item	Unit	Quantity	Unit price	Amount
LANDS AND DAMAGES:				
Joint-use lands:				
Fee acquisition:				
Commercial sites	Acre	20	$2,500	$50,000
Home sites	Acre	275	1,000	275,000
Cropland and pasture	Acre	12,880	175	2,254,000
Woodland	Acre	4,325	100	432,500
Wildlife mitigation lands	Acre	4,200	100	420,000
Subtotal, fee acquisition				3,431,500
Improvements	L.S.			3,000,000
Severance damages	L.S.			300,000
Mineral rights	L.S.			87,500
Resettlement cost	L.S.			140,000
Acquisition cost	L.S.			343,000
Contingencies				1,048,000
Total, joint-use lands				8,350,000
Specific-use lands:				
Fee acquisition:				
Recreation land	Acre	2,000	140	280,000
Fishing (downstream)	Acre	12	140	1,700
Acquisition cost	L.S.			28,000
Contingencies				40,300
Total, specific-use lands				350,000
Grand total, LANDS AND DAMAGES				8,700,000
RELOCATIONS:				
Roads:				
Feceral and State highways (constructed to required safety dimensions)	Mile	4.8	Job	4,595,000
State highways (constructed to present standards)	Mile	4.8	Job	2,629,000
County roads (constructed to present standards)	Mile	7.5	Job	3,089,000
Total, roads				10,313,000

TABLE 8-14

DETAILED COST ESTIMATE, DALTON RESERVOIR, GA. - Continued

Item	Unit	Quantity	Unit price	Amount
RELOCATIONS - Continued				
Utilities:				
Powerlines	Mile	16.90	Job	$304,000
Telephone lines	Mile	7.68	Job	62,000
Waterlines	Mile	1.9	Job	108,000
Gaslines	Mile	2.0	Job	85,000
Water intake structure	Job	-	-	201,000
Power substation	Job	-	-	1,438,000
Gas dispatch station and appurtenances	Job	-	-	403,000
Total, utilities				2,601,000
Contingencies				1,936,000
Grand total, RELOCATIONS				14,850,000
RESERVOIR AND POOL PREPARATION:				
Clearing wooded areas	Acre	4,000	$200	800,000
Boundary line surveys and documentation	L.S.			125,000
Archeological and historical survey	L.S.1/			10,000
Contingencies				155,000
Total, RESERVOIR AND POOL PREPARATION				1,090,000
DAM AND APPURTENANCES:				
Cofferdam and diversion	Job	-	-	283,300
Earth dam:				
Clearing and grubbing	Acre	13	400	5,200
Stripping	Cu.yd.	14,200	1	14,200
Foundation treatment and chimney drain	Job	-	-	50,000
Compacted fill	Cu.yd.	220,000	1.25	275,000
Riprap, dumped	Cu.yd.	6,300	9	56,700
Crushed-stone bedding	Cu.yd.	2,400	9	21,600
Road	Job	-	-	4,800
Total, earth dam				427,500
Concrete nonoverflow dam:				
Clearing and grubbing	Acre	2	400	800
Excavation, common	Cu.yd.	27,200	.75	20,400
Excavation, rock	Cu.yd.	8,800	3	26,400

1/ Funds to be provided and studies to be made by the National Park Service during advanced planning.

TABLE 8-14

DETAILED COST ESTIMATED, DALTON RESERVOIR, GA. - Continued

Item	Unit	Quantity	Unit price	Amount
DAM AND APPURTENANCES - Continued				
Concrete nonoverflow dam - Continued				
Backfill	Cu.yd.	41,200	$1.25	$51,500
Concrete	Cu.yd.	18,500	35	647,500
Foundation treatment and uplift relief system	Job	-	-	45,600
Total, concrete nonoverflow dam				792,200
Spillway:				
Clearing and grubbing	Acre	60	400	24,000
Excavation, common	Cu.yd.	470,900	.75	353,200
Excavation, rock	Cu.yd.	320,300	3	960,900
Backfill	Cu.yd.	16,100	1.25	20,200
Riprap, dumped	Cu.yd.	8,100	9	72,900
Crushed-stone bedding	Cu.yd.	3,000	9	27,000
Concrete, sill and apron	Cu.yd.	55,100	30	1,653,000
Concrete piers	Cu.yd.	6,400	60	384,000
Concrete retaining wall	Cu.yd.	6,000	35	210,000
Foundation anchors	Job	-	-	30,000
Steel, reinforcement	Ton	310	350	108,500
Tainter gates, complete	Each	12	45,000	540,000
Stoplogs, including fixed metal	Job	-	-	54,000
Gate machinery, including hydraulic system	Each	12	30,000	360,000
Power supply and electrical system	Job	-	-	75,000
Spillway bridge, complete	Job	-	-	65,000
Pipe and valves for water quality system	Job	-	-	10,000
Sluice system	Job	-	-	65,000
Total, spillway				5,012,700
Access road, right bank	Job	-	-	30,000
Contingencies				1,314,300
Grand total, DAM AND APPURTENANCES				7,860,000

TABLE 8-14

DETAILED COST ESTIMATE, DALTON RESERVOIR, GA. - Continued

Item	Unit	Quantity	Unit price	Amount
RECREATION DEVELOPMENT:				
Initial facilities:				
Picnic and camping units	Job	-	-	$216,300
Roads, parking, and launching ramps	Job	-	-	1,011,900
Water supply and sanitation	Job	-	-	174,000
Walks, trails, and playgrounds	Job	-	-	85,300
Buildings	Job	-	-	100,000
Contingencies				242,500
Total, initial facilities				1,830,000
Future facilities:				
Picnic and camping units	Job	-	-	1,090,600
Roads and launching ramps	Job	-	-	1,059,400
Water supply and sanitation	Job	-	-	848,600
Walks, trails, and playgrounds	Job	-	-	471,500
Buildings	Job	-	-	100,000
Contingencies				539,900
Total, future facilities				4,110,000
Grand total, RECREATION DEVELOPMENT				5,940,000
BUILDINGS, GROUNDS, AND UTILITIES:				
Spillway control building with equipment	Job	-	-	50,000
Reservoir operations and maintenance buildings and utilities	Job	-	-	300,000
Contingencies				50,000
Total, BUILDINGS, GROUNDS, AND UTILITIES				400,000
PERMANENT OPERATING EQUIPMENT:				
Office equipment	Job	-	-	2,000
Shop equipment and supplies	Job	-	-	15,000
Standby generator	Job	-	-	15,000
Compressed-air system	Job	-	-	5,000

TABLE 8-14

DETAILED COST ESTIMATE, DALTON RESERVOIR, GA. - Continued

Item	Unit	Quantity	Unit price	Amount
PERMANENT OPERATING EQUIPMENT - Continued				
Radio communications facilities	Job	-	-	$3,000
Gage structures	Job	-	-	20,000
Transportation, reservoir and ground maintenance equipment	Job	-	-	10,000
Floating plant	Job	-	-	50,000
Contingencies				20,000
Total, PERMANENT OPERATING EQUIPMENT				140,000
WILDLIFE MITIGATION AND ENHANCEMENT:				
Development in mitigation area	Job	-	-	25,200
Rough-fish barriers	Job	-	-	6,800
Contingencies				8,000
Total, WILDLIFE MITIGATION AND ENHANCEMENT				40,000

TABLE 8-15
ESTIMATE OF ANNUAL CHARGES, DALTON RESERVOIR, GA.

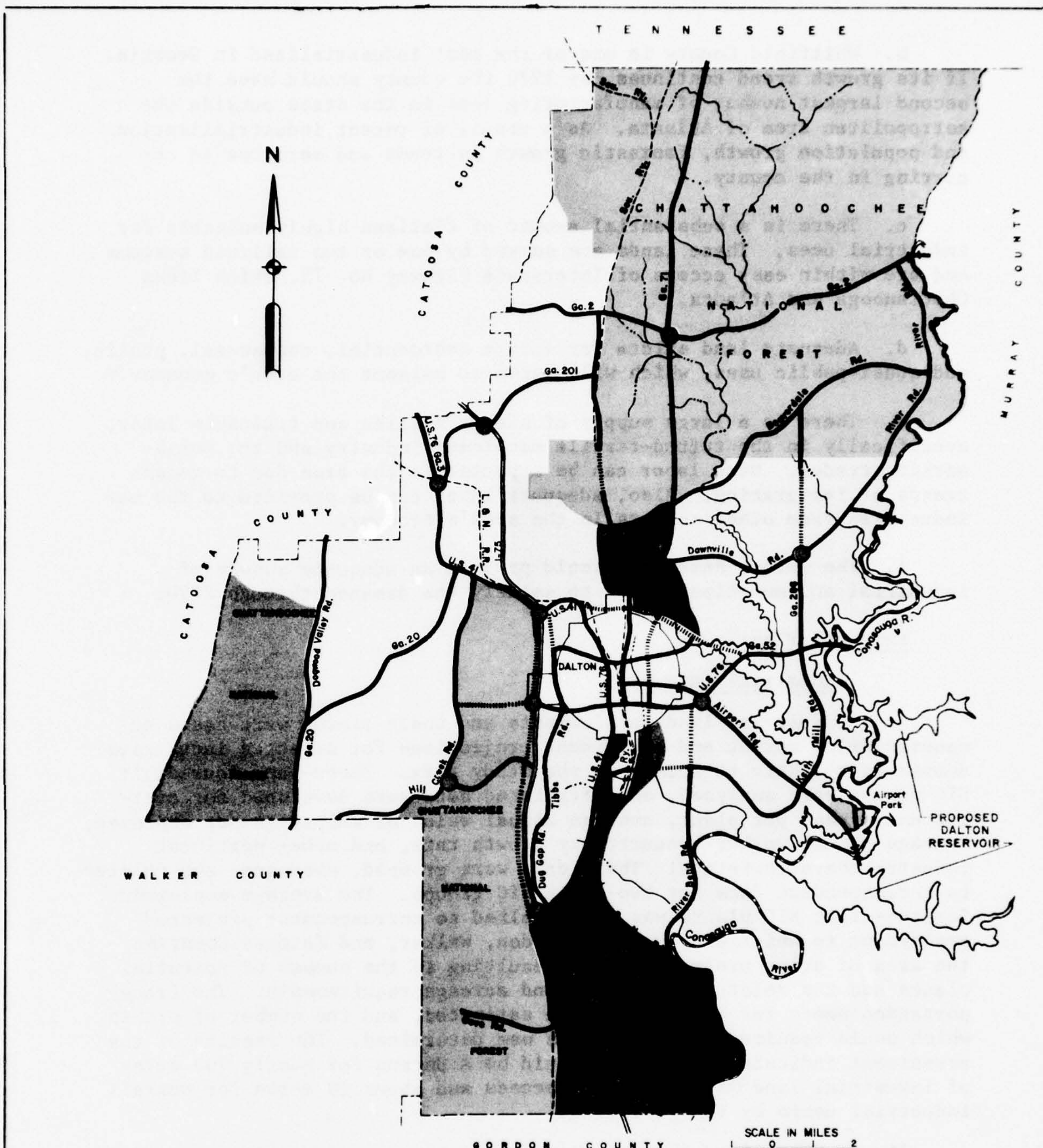
(July 1967 prices)

Item	Financial ($1,000)	Economic ($1,000)
Investment for initial project development:		
Gross investment:		
Total first cost	39,500	39,500
(Market value of lands - amount is included in line above)	-	(3,713.2)
Interest during construction - 3.25% for one-half of 4-yr. construction period, 6.50%	2,568	2,568
Total, gross investment	42,068	42,068
Less net salvage value - $3,713,200x0.80	-	2,971
Net investment, initial project development	42,068	39,097
Annual charges, initial project:		
Interest on gross investment:		
Financial: $42,068,000x0.0325	1,367	-
Economic: $42,068,000x0.0325	-	1,367
Economic: Adjustment for net loss of land productivity - $3,713,200x (0.05-0.0325)	-	65
Amortization of net investment:		
Financial: $42,068,000x0.001384	58	-
Economic: $39,097,000x0.001384	-	54
Operation and maintenance:		
Dam and reservoir	90	90
General recreation	74	74
Fish and wildlife recreation	38	38
Wildlife mitigation and enhancement	6	6
Major replacements:		
Dam and reservoir	6	6
General recreation and fish and wildlife recreation	22	22
Associated cost	-	13
Loss in hunting opportunities	-	4
Total, annual charges for initial project	1,661	1,739

1/ Annual losses from inundation of existing flood control improvements on Mill Creek in Whitfield County, Ga.

TABLE 8-15
ESTIMATE OF ANNUAL CHARGES, DALTON RESERVOIR, GA. - Continued

Item	Financial ($1,000)	Economic ($1,000)
Investment for future increment of recreational development:		
First cost of increment	4,800	4,800
Interest during construction		
Total, investment for future project increment	4,800	4,800
Present worth of future investment ($4,800,000)x0.5052	2,425	2,425
Annual charges, future project increment:		
Interest on investment:		
Financial: $2,425,000x0.0325	79	-
Economic: $2,425,000x0.0325	-	79
Amortization of investment:		
Financial: $2,425,000x0.001384	3	-
Economic: $2,425,000x0.001384	-	3
Maintenance and operation:		
Dam and reservoir	-	-
General recreation	183	183
Major replacements:		
Dam and reservoir	-	-
General recreation	20	20
Total, annual charges for future project increment	285	285
Grand total, annual charges for entire project development	1,946	2,024



COMPREHENSIVE PLAN OF DEVELOPMENT FOR WATER RESOURCES IN THE APPALACHIAN REGION

GENERALIZED LAND USE & THOROUGHFARE PLAN

WHITFIELD COUNTY, GEORGIA

LEGEND

LAND USE	MAJOR THOROUGHFARES
RESIDENTIAL	EXISTING
COMMERCIAL	PROPOSED
INDUSTRIAL	INTERSTATE HIGHWAY - 75

EXHIBIT-8-28

b. Whitfield County is one of the most industrialized in Georgia. If its growth trend continues, by 1970 the county should have the second largest number of manufacturing jobs in the State outside the metropolitan area of Atlanta. As a result of recent industrialization and population growth, fantastic growth in trade and services is occurring in the county.

c. There is a substantial amount of flatland highly suitable for industrial uses. These lands are served by one or two railroad systems and are within easy access of Interstate Highway No. 75, which links Chattanooga and Atlanta.

d. Adequate land exists for future residential, commercial, public, and quasi-public uses, which will serve to balance the area's economy.

e. There is a large supply of highly skilled and trainable labor, specifically in the tufted-textile machinery industry and the metal-working trades. More labor can be expected in the area due to recent trends of immigration. Also, adequate labor can be provided to the new industries from other sectors in the area's economy.

f. The Dalton Reservoir would provide an adequate supply of industrial and municipal water to satisfy the demands through 2020.

Land Use Plan

Industrial Land Use

Industrial land requirements and their timing were based on manufacturing output and employment projections for selected industries deemed most likely to locate in the study area. Three- and four-digit SIC groups were analyzed, and affiliated data were developed for average employment per plant, average annual value of shipments per employee, average annual worker productivity growth rate, and other pertinent industry characteristics. These data were grouped, averaged, and related to correspondent data for two-digit SIC groups. The average employment for two-digit SIC plants was then applied to correspondent projected employment in Whitfield, Murray, Gordon, Walker, and Catoosa Counties - the area of prime project impact, resulting in the number of potential plants and the related investment and acreage requirements. The transportation needs for each group were estimated, and the number of plants which would require railway sidings was determined. The results of the assessment indicated that there would be a demand for nearly 700 acres of industrial land with rail-spur access and about 10 acres for nonrail industrial users by the year 2020.

It was recognized that whereas future labor productivity increases would result in diminishing acreage needs for production facilities, space requirements for parking, outside storage, and warehousing would expand with time. To insure an adequate amount for industry's selection,

the estimates were doubled, resulting in a projected need for approximately 2,000 acres to accommodate reservoir-induced growth by 2020.

Under the generalized land use plan for Dalton, about 16,000 acres, excluding flood plains and lands with slopes greater than 5 percent, are available for location of industry. For purposes of this study, the industrial areas contained in the plan have been divided into two industrial districts as follows:

a. Smith Industrial District. - This district encompasses the industrial area lying north of the city of Dalton. The area is anticipated to accommodate the first phase of industrial development occasioned by the reservoir project, with the exception of any unforeseen large acreage requirements by particular industries.

b. Whitfield Industrial District. - This is the industrial area south of Dalton. According to plan, industrial development would begin here after the Smith Industrial District would be filled or partially developed, with continuing development spreading south of the city.

Main trunklines of city utilities already extend into the two industrial districts. Future needs for utilities and facilities would require only an extension of services based upon the potential plants' acreage requirements.

Table 8-16 summarizes, by decade, the total industrial investment including buildings and equipment for the Dalton area to the year 2020. The figures reflect only activities which would result directly from the availability of water for plant use from Dalton Reservoir project.

Residential Land Use

Residential development in the Dalton area is proposed to take place in the space set aside for that purpose in the land use and thoroughfare plan. Nearly 8,200 acres of residential land would be required to accommodate the population growth expected to result from the construction of Dalton Reservoir. Table 8-17 shows, by decade, the projected needs for various classes of dwelling units with their respective acreage requirements. Phasing of the land needs is based upon the employment growth projections.

The total new investment for residential development over the 50-year study period is estimated at $865 million. The amount includes the cost of land acquisition and improvement, new construction, as well as rehabilitation and redevelopment of existing units. Table 8-18 presents a phasing of this investment by decades to the year 2020. Basis for the estimates are the future average annual family incomes developed from per capita income projections.

TABLE 8-16
INDUSTRIAL PLANT AND LAND DEVELOPMENT COSTS, IN THOUSAND DOLLARS

(July 1967 prices)

	1970-1980	1980-1990	1990-2000	2000-2010	2010-2020	Total
Plant investment	42,817	125.626	274,500	466,921	453,577	1,363,441
Land development:						
Lands	100	150	250	305	137.5	942.5
Streets	173.4	253.1	421.9	525	234.4	1,607.8
Utilities	72.2	105.3	175.5	218.4	97.5	668.9
Railroad spurs	130	166	274	378	156.8	1,104.8
Other expense, 25% of listed development costs	119	168.6	280.3	356.6	156.5	1,081
Total, land development	594.6	843.0	1,401.7	1,783.0	782.7	5,405.0
Grand total	43,411.6	126,469.0	275,901.7	468,704.0	454,359.7	1,368,846.0
Rounded	43,412	126,469	275,902	468,704	454,360	1,368,847

TABLE 8-17

RESIDENTIAL LAND DEVELOPMENT NEEDS

Dwelling units with acreage requirements		1970-1980	1980-1990	1990-2000	2000-2010	2010-2020
Single-family:						
Total units	number	1,273	2,860	4,592	4,489	2,058
Total site area (2.5 units/acre)	acres	509	1,144	1,837	1,796	823
Two-family:						
Total units	number	47	105	169	166	76
Total site area (7.8 units/acre)	acres	6	13	21	21	10
Multifamily:						
Total units	number	422	949	1,522	1,489	683
Total site area (15 units/acre)	acres	29	64	102	100	46
Mobile homes:						
Total units	number	67	151	242	236	109
Total site area (22 units/acre)	acres	3	7	11	11	5
Total:						
Residential sites	acres	547	1,228	1,971	1,928	884
Streets, easements, etc. (25% of line above	acres	137	307	493	482	221
Grand total, lands;						
By decade	acres	684	1,535	2,464	2,410	1,105
Cumulative	acres	684	2,219	4,683	7,093	8,198

TABLE 8-18

RESIDENTIAL DEVELOPMENT COSTS, IN THOUSAND DOLLARS

(July 1967 prices)

Dwelling units	1970-1980	1980-1990	1990-2000	2000-2010	2010-2020
Single--family:					
Unit cost = 2.5 times annual family income	27.5	33.0	44.0	50.0	59.0
Total units	35,000	94,000	202,000	224,000	121,000
Two-family:					
Unit cost = 2 times annual family income	22.0	26.4	35.2	39.9	47.2
Total units	1,000	2,700	5,900	6,600	3,500
Multifamily:					
Unit cost = 1.75 times annual family income	19.2	23.1	30.8	34.9	41.3
Total units	8,100	21,900	46,800	51,900	28,200
Mobile homes:					
Unit cost = 0.9 times annual family income	9.9	11.9	15.8	17.9	21.2
Total units	700	1,800	3,800	4,200	12,300
Total development costs:					
By decade	44,800	120,400	258,500	286,700	155,000
Cumulative	44,800	165,200	423,700	710,400	865,400

NOTE. - 15 percent of unit costs is for land acquisition, and 14 percent, for land improvement.

Commercial Land Use

It is believed that the commercial activity of the existing establishments in Dalton would continue to serve adequately current and future demand in the absence of Dalton Reservoir. However, with Dalton Reservoir, there would be a need for additional commercial services in the area, and it is assumed that the demand would grow in direct proportion to the capability of the added, project-induced population to support new facilities. Space requirements for retail and selected service businesses are therefore based upon the projected income of such additional population and the estimated dollar-volume sales generated by that income.

It is projected that, with Dalton Reservoir built, nearly 13.3 million square feet of new space would be needed for retail and service activities. Allowance for parking, in a 3-to-1 ratio, is included in the amount. Data used and the phased projections for future commercial space requirements in the Dalton area are presented in tables 8-19 through 8-21.

It was not determined what part of the commercial space expansion would occur within the central business district of Dalton and the immediate area surrounding it; however, local official policy supports the provision of adequate parking as part of future commercial development. Strategically located areas that would aid most effectively such development were designated accordingly on the land use and thoroughfare plan.

Commercial development normally lags behind industrial development. The phasing of commercial investment was therefore based on the future employment and income growth, which falls behind the population growth trend. Slightly over 300 acres of commercial land would be required in the Dalton area to serve the additional population expected as a result of the project. It is estimated that Dalton Reservoir would stimulate an investment in commercial facilities of slightly more than $68 million over the period to year 2020. Table 8-22 shows the investment by decades.

Public Facilities and Utilities Plan

It is expected that with the expansion of industrial jobs resulting from development, attendant population growth would require substantial increases in public facilities. New development would have a major effect on facility needs for education, health, fire protection, recreation, and utilities. Phasing and cost of projected new public facilities in these categories are presented in table 8-23. Although other facilities also could be affected, it is anticipated that their current development would be sufficient to meet respective demands to 2020.

TABLE 8-19
RECEIPTS FROM RETAIL SALES AND SERVICES, DALTON AREA

	Percent of per capita income		Induced by Dalton Reservoir (July 1967 prices)		
Year	Sales	Services	Period	Sales	Services
1967	62	8			
1980	55	12	1970-1980	$9,800	$2,100
1990	50	14	1980-1990	19,500	7,500
2000	45	16	1990-2000	57,000	20,200
2010	40	18	2000-2010	57,800	26,000
2020	35	20	2010-2020	30,000	17,200
			Total, 1970-2020	174,100	73,000

TABLE 8-20
NEW COMMERCIAL SPACE NEEDS WITH DALTON RESERVOIR

	Amount in square feet	
1970-1980:		
Built-up area (1 sq. ft./$60 receipts)	198,300	
Parking area, 3:1	595,000	
		793,300
1980-2000:		
Built-up area (1 sq. ft./$70 receipts)	1,488,600	
Parking area, 3:1	4,465,800	
		5,954,400
2000-2020:		
Built-up area (1 sq. ft/$80 receipts)	1,637,500	
Parking area, 3:1	4,912,500	
		6,550,000
Total, 1970-2020		13,297,700

TABLE 8-21
COMMERCIAL DEVELOPMENT STANDARDS, DALTON AREA

		Neighbor-hood Center	Community Center	Regional Center
Radius of service area	miles	0.5	2	4
Minimum population to support	number	4,000	35,000	150,000
Site area, gross	acres	4-8	10-30	40-100
Desirable size acre/1,000	population	1	0.75	0.67
Floor area, gross	square feet	30-000-75,000	100,000-250,000	400,000-1,000,000
Stores and shops	number	5-20	15-40	40-80
Parking requirements	number of cars	200-600	1,000-3,000	4,000 plus

TABLE 8-22
COMMERCIAL DEVELOPMENT COSTS, IN THOUSAND DOLLARS

(July 1967 prices)

Period	Area required (acres)	Investment: Amount	Investment: Percent of total
1970-1980	15	3,342.0	5
1980-1990	49	10,917.2	16
1990-2000	67	14,927.6	22
2000-2010	77	17,155.6	25
2010-2020	98	21,834.4	32
Total, 1970-2020	306	68,176.8	100

NOTE. - Construction cost is based on $5/sq. ft. (or $217,800/acre) including parking. Land cost is $5,000/acre.

TABLE 8-23

PUBLIC FACILITIES AND UTILITIES DEVELOPMENT COSTS, IN THOUSAND DOLLARS

(July 1967 prices)

	1970-1980	1980-1990	1990-2000	2000-2010	2010-2020	Total
New schools (lands and facilities):						
Non-Federal share, 100%	1,467	2,997	3,486	0	0	7,950
New library branches:						
Non-Federal share, 20%	0	63.6	63.6	63.6	0	190.8
Federal share, 80%	0	254.4	254.4	254.4	0	763.2
Total, libraries	0	318.0	318.0	318.0	0	954.0
Added hospital facilities:						
Non-Federal share, 20%	307	1,008	0	0	0	1,315
Federal share, 80%	1,230	4,032	0	0	0	5,262
Total, hospital facilities	1,537	5,040	0	0	0	6,577
Fire protection facilities:						
Non-Federal share, 100%	75	0	75	75	0	225
Added recreational lands and facilities:						
Non-Federal share, 100%	0	0	390	390	0	780
Utilities:						
For new residential areas:						
Non-Federal share, 100%	273	577.2	998.4	967.2	444.6	3,260.4
Sewage and water treatment plant expansion:						
Non-Federal share, 50%	0	0	4,250.0	0	875.0	5,125.0
Federal share, 50%	0	0	4,250.0	0	875.0	5,125.0
Total, utilities	273	577.2	9,498.4	967.2	2,194.6	13,510.4
Grand total, rounded:						
By decade:						
Non-Federal	2,122	4,646	9,263	1,496	1,320	18,847
Federal	1,230	4,286	4,504	254	875	11,149
Cumulative	3,352	12,284	26,051	27,801	29,996	29,996

Transportation Plan

The highway system as developed in the Generalized Land Use and Thoroughfare Plan is being considered by the local, state and federal highway interests and should be constructed without regard to the proposed Dalton Reservoir project. The system however would serve adequately the transportation needs that would arise from the project's economic expansion effects, and no expenditures for additional highways are included in the project-induced developmental costs. Expansion of this conceptual plan to accommodate all future growth in this area may require additional routes and some change in existing routes as urban development occurs. Railroad spur expenditures required for industrial expansion are included in the industrial land development costs.

Summary of Development Plan Investments

An ultimate investment of more than $2.33 billion is projected under the development plan. This would have a substantial impact on strengthening the Appalachian economy in Georgia, especially in the five counties near Dalton Reservoir. The investment would have many multiplier effects not estimated in this report. The value of new private industrial, residential, and commercial developments would support a tax structure that would permit local public and quasi-public agencies to incur the indebtedness required for providing needed new facilities and to share in the cost of the Federal water resource development. Table 8-24 summarizes the total amounts for the various investment categories in the Dalton area developmental plan.

Average Annual Equivalent of Developmental Investments

Public and private investments under the Dalton area development plan were converted to an annual equivalent by discounting them, at a 3.25-percent annual rate, to their 1975 worth and applying the proper interest and amortization factors to the non-Federal and Federal portions of the total of 1975 worths.

The economic life of the plan was taken as 100 years beginning in 1975. To support this life, it was assumed that in 50 years, all public and residential investments, as well as one-half of the industrial and commercial investment (the buildings), would be replaced, while the other half of the industrial and commercial investment (the equipment) would be replaced every 25 years.

Interest and amortization factors were based on a 5-percent annual rate except for the Federal portion of the public investments, where a rate of 3.25 percent was used.

Table 8-25 presents a summary of annual costs for the Dalton area developmental plan.

TABLE 8-24

PROJECTED INCREASES IN PRIVATE AND PUBLIC INVESTMENTS DUE TO DALTON RESERVOIR

NOTE. - Amounts, in thousand dollars, are based on 1967 prices

Investment category	1970-1980	1980-1990	1990-2000	2000-2010	2010-2020	Total
Industrial	43,412	126,469	275,902	468,704	454,360	1,368,847
Residential	44,800	120,400	258,500	286,700	155,000	865,400
Commercial	3,342	10,917	14,928	17,156	21,834	68,177
Public and quasi-public:						
Non-Federal	2,122	4,646	9,263	1,496	1,320	18,847
Federal	1,230	4,286	4,504	254	875	11,149
Total:						
Non-Federal	93,676	262,432	558,593	774,056	632,514	2,321,271
Federal	1,230	4,286	4,504	254	875	11,149
Grand total	94,906	266,718	563,097	774,310	633,389	2,332,420
Rounded						2,332,400

TABLE 8-25
SUMMARY OF EQUIVALENTS OF DEVELOPMENTAL INVESTMENTS
IN THOUSAND DOLLARS

Investment type	1975 worth	Average annual cost
Private:		
Industrial and commercial:		
Plants	369,906	18,637
Equipment	515,776	25,986
Total, industrial and commercial	885,682	44,623
Residential	501,776	25,281
Public:		
Non-Federal	13,477	679
Federal	8,413	285
Total, public	21,890	964
Grand total, all investments	1,409,348	70,868

SECTION V - BENEFITS

18. SUMMARY

The Dalton Reservoir project would provide benefits - both to the Nation and the project region - which have been classified into two categories: user and expansion benefits. Subsequent paragraphs of this section describe the procedures and techniques used to measure the benefits creditable to the various functions of the plan. The following table summarizes the benefits by category and project function and shows their distribution to the national and regional accounts.

TABLE 8-26
DETAILED SUMMARY OF BENEFITS, DALTON RESERVOIR, GA.

Category and class of benefits	Annual benefits, in thousand dollars: National account only	Regional account only	National and regional account	Total national account	Total regional account
User benefits:					
Water supply	-	-	195	195	195
Water quality control	-	-	163	163	163
Flood control and land enhancement	-	-	443	443	443
Recreation	200	-	1,758	1,958	1,758
Total, user benefits	200	-	2,559	2,759	2,559
Expansion benefits:					
Redevelopmental	-	360	104	104	464
Developmental	-	157,465	4,670	4,670	162,135
Less adjustment for secondary cost	0	2,500	0	0	2,500
Total, expansion benefits	-	155,325	4,774	4,774	160,099

19. USER BENEFITS

Water Supply

The Federal Water Pollution Control Administration evaluates the future municipal and industrial water needs in the Dalton area as 29 mgd by 1980; 64 mgd by 2000; and 137 mgd by 2020. (See Appendix D.). The present source, the Conasauga River, which serves portions of four counties, would become deficient by 1980. Due to the rivers limited low flows during extended dry periods, local interests presently envision a complete change in source for future demand. Consequently, any impoundment, such as Dalton Reservoir, which could meet future water supply needs would result in marked benefits to industrial and municipal users. Exhibit 8-5 (page III-8-26) shows the average annual benefit values for various scales of reservoir storage development. The benefits are based on projections for water supply demand through the year 2020, and these, in turn, on population projections provided by the Corps of Engineers. Under the procedure, the anticipated increase in water use per employee due to increased future productivity was partially offset by an assumed improvement in technology of water use resulting in a lesser amount of water needed per unit of production.

Project benefits attributed to water supply are assumed to equal the annual differential costs for obtaining the needed water from the least costly alternative to Dalton Reservoir. The least costly of three alternatives investigated was developing the supply on the Coosawattee River and transmitting the water to Dalton area. It was assumed that the alternative source would be developed in two distinct phases, with construction taking place in 1980 and 2000.

The existing municipal water supply intake is located on the Conasauga River in what would be the upper end of Dalton Reservoir. Proposed water elevation in the reservoir would allow use of the present raw water intake without modification.

Based on the above considerations, equivalent average annual benefits stemming from the water supply function of Dalton Reservoir are estimated at $195,000.

Water Quality Control

Projected development in the Dalton area indicates that in the near future there would be a water quality problem in the Conasauga River downstream from the city. The 7-day-10-yr. low flow is 92 cfs. The FWPCA report presented in Appendix D concludes that by 1980, despite the coming installation of secondary waste treatment facilities at Dalton, the river water quality would be so degraded at to be unacceptable for warm-water fish species and many other beneficial uses.

Increased minimum streamflows for quality maintenance are one obvious solution to the problem. The minimum flow needs below Dalton (at Tilton, Ga.), as estimated by the FWPCA for year 2020, are as follows: 130 cfs in October; 95 cfs in November and March; 80 cfs in December through February; 190 cfs in April and May; and 226 cfs in June through September. These values are based on population and economic activity projections as outlined above for water supply needs.

Benefits that would accrue from providing needed storage in Dalton Reservoir to meet the demand for augmented streamflows were determined by the least-costly-alternative method. Of six alternative measures investigated, tertiary treatment of future wasteloads was the most economical, and its cost was taken to equal the benefits that would stem from provision of augmented flows in the Conasauga River. In this case, tertiary treatment was assumed to increase the removal of BOD from 90 to 98 percent. Relevant cost estimates were taken from published information on treatment costs as function of treated waste volumes and percentage of BOD removal. The available cost data, reflecting a 4.5-percent discount rate, were converted to correspondent costs based on a 3.25-percent discount rate. Exhibit 8-5 shows the average annual benefit values for various scales of reservoir storage development.

The city of Dalton has presently a sewage pumping station under design which will transfer the area's raw sewage to a treatment plant on Drowning Bear Creek, a tributary of the Conasauga River downstream from Dalton Dam. Installation here of tertiary treatment facilities as the least costly alternative was assumed to take place in two phases, in 1975 and 2005. Annual equivalent cost for such facilities to meet the projected water qualtiy needs to 2020 is estimated at $163,000. This amount has been equated to the annual water quality control benefits that would flow from the potential Dalton Reservoir project.

Flood Control

The following presents the results of studies and field investigations on possible flood control along the Conasauga, Oostanaula, and Coosa Rivers, from the Dalton Dam site to the Georgia-Alabama State line.

Extent and Character of Flood-Prone Area

The flood plain along the studied stream reaches varies in width generally from about 1,300 feet to 5,000 feet, with an average of about 3,000 feet. The overflow areas contain two urban centers, the cities of Rome and Calhoun, about 37,760 acres of agricultural lands, and numerous transportation routes.

About 750 acres of industrial, commercial, and residential property in Rome, Ga., would be inundated by a flood equivalent to that of April 1886, the maximum of record. That flood, produced by high flows in the Oostanaula and Etowah Rivers, reached a stage of 40.3 feet at Fifth Avenue Bridge. The Fourth Ward, part of the city bordering on the Oostanaula and Coosa Rivers, is now protected against floods up to the maximum recorded stage by a system of levees completed by the Corps of Engineers in 1941. Allatoona Dam, on the Etowah River, built by the Corps of Engineers and operated since 1949, reduces flooding in Rome along that river, but the city is still subject to inundation from high flows originating in the Oostanaula River Basin and the uncontrolled watershed area of the Etowah River.

The city of Calhoun, 20 miles northeast of Rome, is also subject to some overflow from the Oostanaula River. About 35 acres in the city would be inundated by a flood equal to that of April 1886, which reached a stage of 36.6 feet at the Resaca gage. Flooding in Calhoun begins at 28 feet on that gage. Rural development in the flood plain consists chiefly of farmsteads and small community groups. Lands are used for general farming. The flood plains of the Oostanaula and Conasauga Rivers contain some of the best farmland in the region. Agriculture is an important occupation in the area, and lands suitable for farming are at a premium.

Numerous highways and two railroads cross the flood plain.

The value of all property in the flood plain between the proposed site of Dalton Dam and the Georgia-Alabama State line is estimated at nearly $39 million. The flood plain within these limits was divided for study purposes in five zones (as indicated in exhibit 8-1, page III-8-3), and the value of present development in the individual zones is itemized in table 8-27.

Flood Damages

Data used to develop flood damage estimates for the study area are based on a 1955 county-by-county field survey of actual damages. A reconnaissance of the area was made in 1967 to update and adjust previous survey data to current conditions and values. Damages in each of the five selected damage zones were related to a control point (river gage) in the zone. From data developed in the field surveys, it is estimated that a recurrence of the February 1946 flood stages would cause at present $289,000 damages, while losses from a 100-year-frequency flood, should it occur in February, would be nearly $2.07 million. A breakdown of these amounts by zone and category of property is presented in table 8-28.

TABLE 8-27
DEVELOPMENT IN FLOOD PLAIN FROM DALTON DAM SITE
TO GEORGIA-ALABAMA LINE

NOTE. - Values, in thousand dollars, are based on 1967 prices

Study zone and development class	Item		Value
A-B, Conasauga River, mile 24.8 to mile 0:			
Agricultural lands	5,030	acres	1,358
Transportation routes	5.5	miles	590
Total, zone A-B			1,948
B-C, Oostanaula River, mile 46.95 to mile 26.7:			
Agricultural lands (including 35 urban acres)	5,005	acres	1,383
Residential	75	structures	375
Commercial	5	firms	125
Transportation routes	3.6	miles	705
Total, zone B-C			2,588
C-D, Oostanaula River, mile 26.7 to mile 0:			
Agricultural lands	8,710	acres	2,352
Transportation routes	8	miles	610
Total, zone C-D			2,962
D-E, Coosa River, mile 285.78 to mile 284.78:			
Urban lands	750	acres	2,700
Residential	285	structures	2,000
Commercial	135	firms	16,500
Industrial	5	firms	2,500
Public	2	structures	1,547
Transportation routes	1.7	miles	505
Total, zone D-E			25,752
E-F, Coosa River, mile 284.78 to mile 255.2:			
Agricultural lands	19,050	acres	5,144
Transportation routes	3.5	miles	280
Dams	1	structure	None
Total, zone E-F			5,424
Grand total			38,674

TABLE 8-28

ESTIMATED DAMAGE IN STUDY AREA FROM FLOODS OF SPECIFIC MAGNITUDE

NOTE. - Amounts, in thousand dollars, are based on 1967 development and prices, with Carters and Allatoona Reservoirs in operation

Damage zone with control point and damage categories	February 1946 flood	100-year-frequency flood
Conasauga River: A-B, Tilton:		
Agricultural:		
Crops	15	21
Other farm property	15	25
Roads and railroads	10	15
Total, zone A-B	40	61
Oostanaula River:		
B-C, Resaca:		
Agricultural:		
Crops	19	26
Other farm property	23	29
Roads and railroads	7	11
Urban, in Calhoun, Ga.	9	54
Total, zone B-C	58	120
C-D, Bells Ferry:		
Agricultural:		
Crops	32	38
Other farm property	40	47
Roads and railroads	20	30
Total, zone C-D	92	115
Coosa River:		
D-E, Rome: Urban	0	1,497
E-F, Mayos Bar:		
Agricultural:		
Crops	34	62
Other farm property	63	196
Roads and railroads	2	15
Total, zone E-F	99	273
Grand total	289	2,066

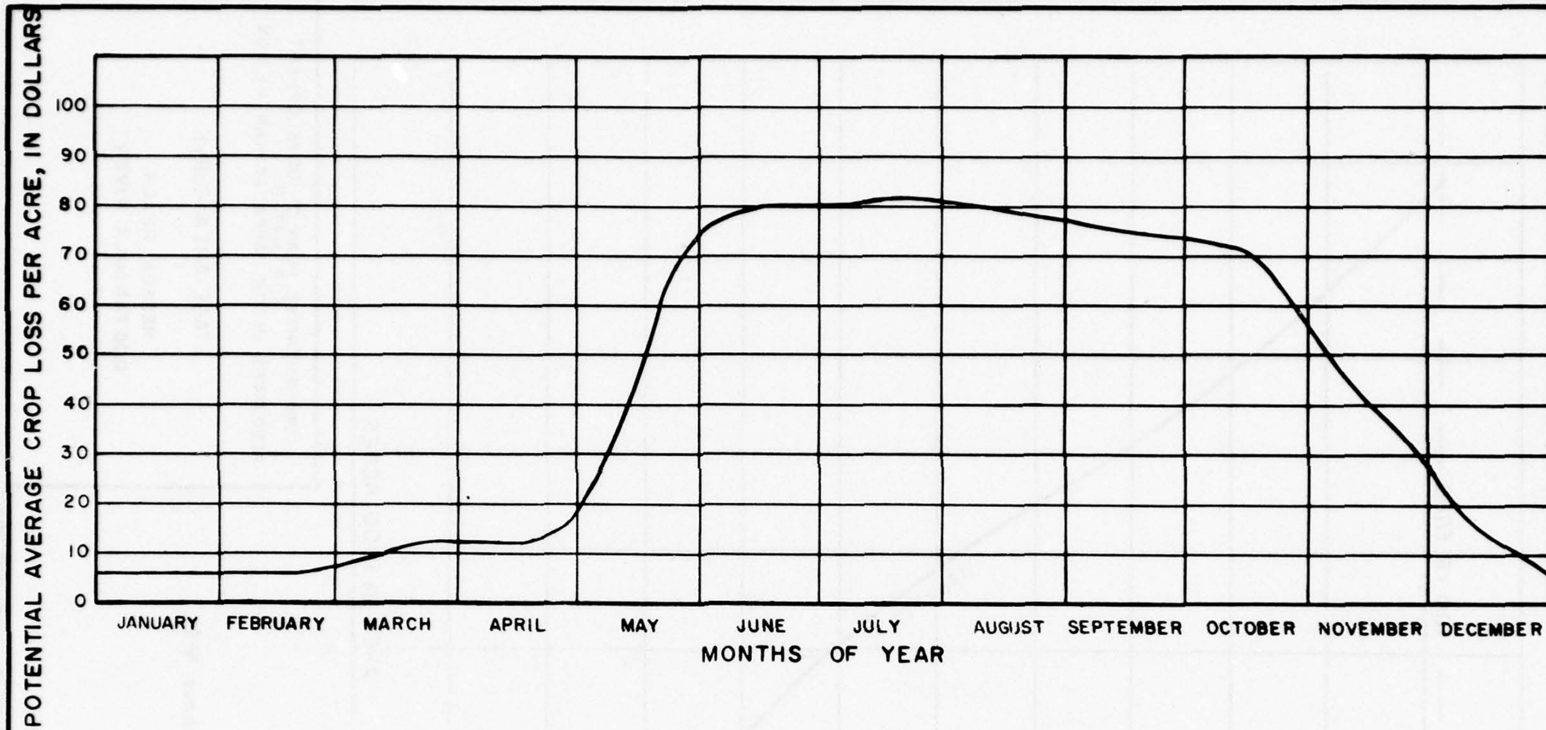
Average Annual Damage to Crops. - The severity of agricultural damage varies with the height of floods and with the season of the year. The most damaging floods occur from late spring, the planting season, until November, the time most of the summer crops have been harvested. A late spring flood will destroy growing crops and make it necessary to replant. The replanted crops could be damaged by later floods and also generally give reduced yields due to the shortened growing season. Insect damage also is more severe with late plantings.

In order to make an estimate of flood damage, working curves were developed for each zone. These curves give the relations between season and potential crop damage per acre, stage and flooded area, and stage and damage; also, stage and frequency of stage, flooded area and frequency of occurrence, and damage and frequency of occurrence for conditions both with and without Dalton Reservoir.

Seasonal crop damage curve. - Growing crop losses and those due to the delay and cost of replanting were combined to form a curve that shows the damage per cleared acre of land when inundated at any time during the year. The cost of planting, cultivating, and delay accumulated at the rate the farmwork progresses during spring. Later in the season, the value of crops is based on yields and current commodity prices which diminish with the progress of harvest. The seasonal crop damage curve presents for each point of time in the year the average of the per acre values of all crops weighted in proportion to their percentage share of the flood plain. The duration of floods in the study area is sufficient to destroy rowcrops but would only partially destroy korean and sericea lespedeza and pasture. If a later crop, such as soybeans, could be substituted after a flood for annual lespedeza, it was assumed that the later crop would be harvested and that only the cost of planting the earlier crop would be a loss. (See exhibit 8-29.)

Stage-area curve. - This curve gives the area of cleared and wooded land that would be inundated by floods of various magnitudes. The flooded areas, determined for the various damage zones, were plotted against stages on the pertinent control gages, which were selected for best reflecting the flood condition in the zones. This is illustrated for reach B-C on the Oostanaula River, using the Resaca gage as the control point, on exhibit 8-30.

Stage-frequency curve. - The frequency of occurrence of floods was related to corresponding stages. Curves were prepared to show the frequency with present conditions and as expected with the plan of improvement. See exhibit 8-31 for example curve for Resaca gage.



NOTE:

Price Level July 1967.

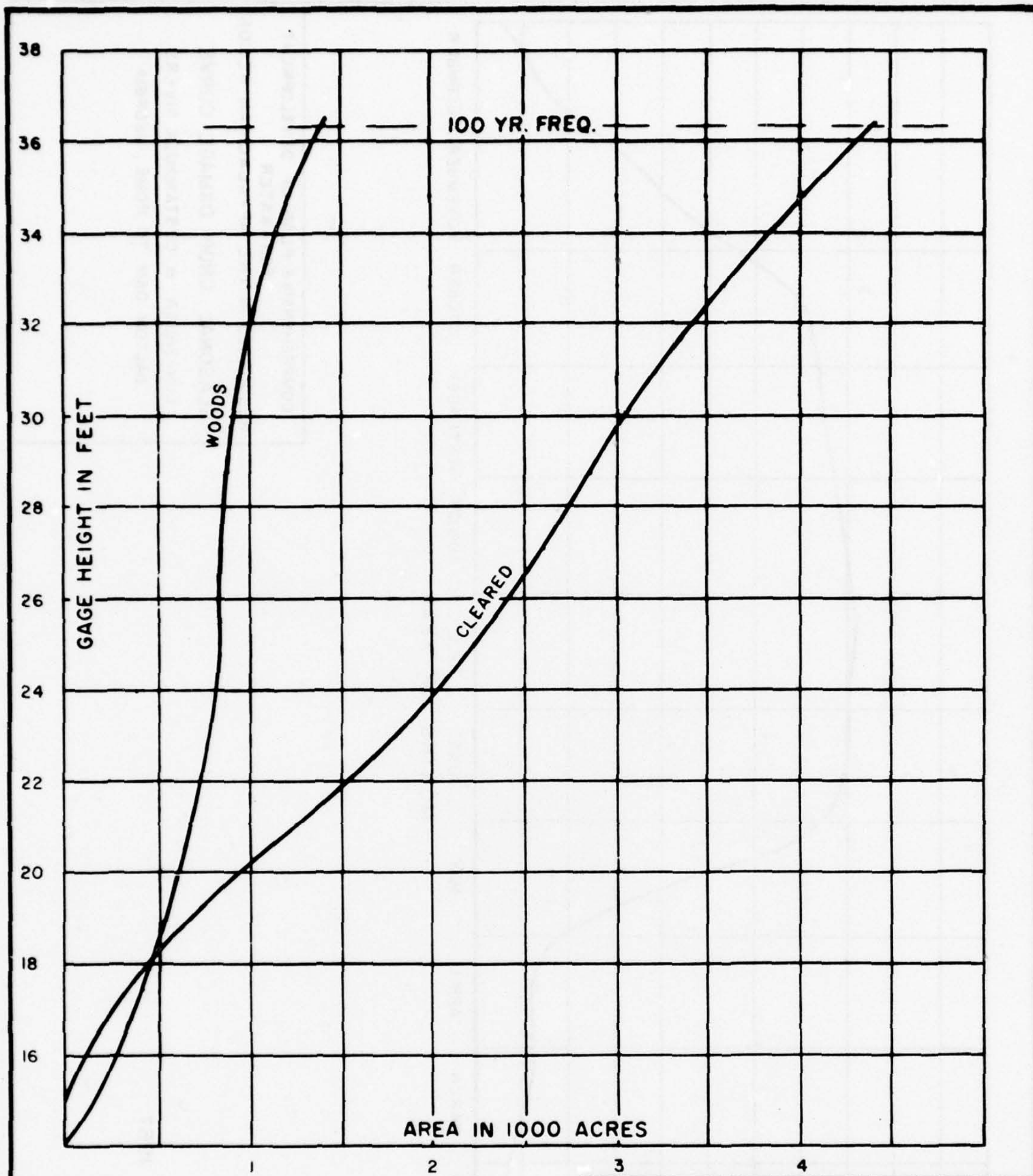
COMPREHENSIVE PLAN OF DEVELOPMENT
FOR WATER
RESOURCES IN THE APPALACHIAN REGION

SEASONAL CROP DAMAGE CURVE

CONASAUGA & OOSTANAULA RIVERS

DALTON DAM TO ROME, GEORGIA

EXHIBIT 8-29



COMPREHENSIVE PLAN OF DEVELOPMENT FOR WATER RESOURCES IN THE APPALACHIAN REGION

STAGE-AREA CURVE

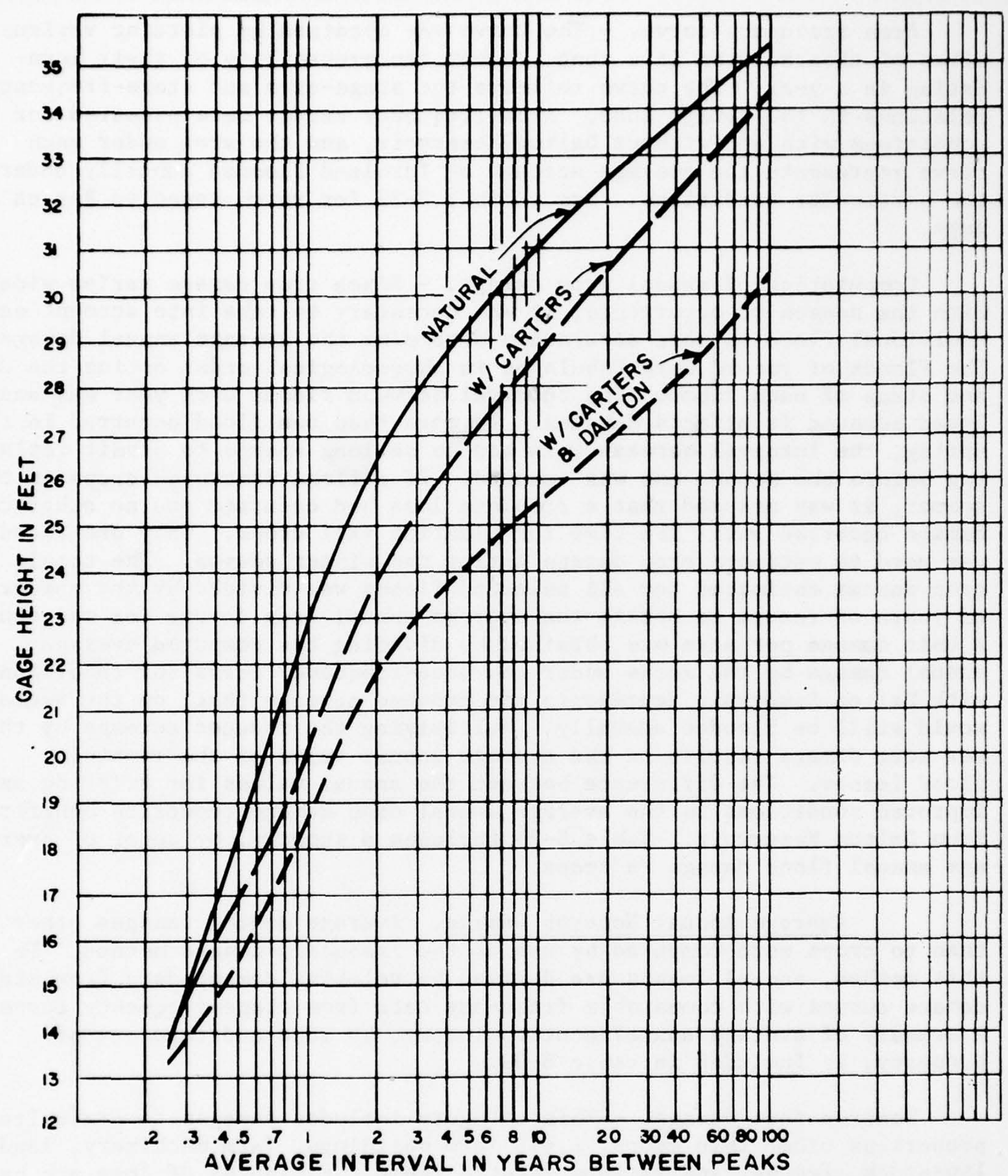
RESACA REACH

OOSTANAULA RIVER

NOTE:

Gage zero 604.14 above M.S.L.

EXHIBIT 8-30



NOTE:

Gage zero 604.14 above M.S.L.

COMPREHENSIVE PLAN OF DEVELOPMENT FOR WATER RESOURCES IN THE APPALACHIAN REGION

STAGE - FREQUENCY CURVES

(NATURAL AND REVISED)

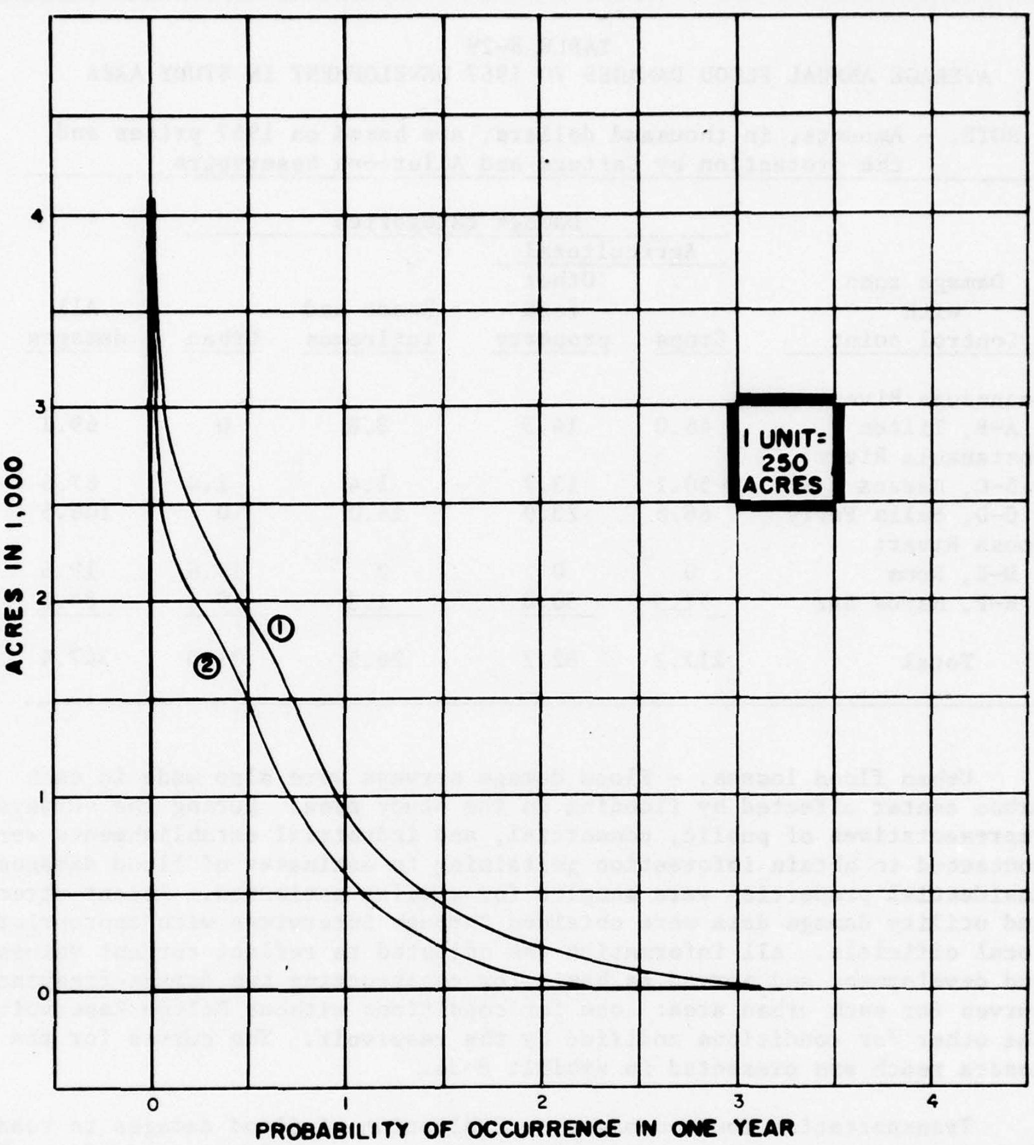
RESACA GAGE
OOSTANAULA RIVER

Area frequency curve. - The curve was obtained by plotting various sizes of cleared area in a zone against the probability of their inundating in a year. The curve reflects the stage-area and stage-frequency relations in the damage zone. Area-frequency curves were prepared for conditions with and without Dalton Reservoir, and the area under each curve represents the average acreage of farmland flooded annually under the particular conditions. See exhibit 8-32 for reach keyed to Resaca gage.

Computation of annual crop damage. - Since crop damage varies widely with the season of occurrence, it was necessary to take into account each individual flood to more accurately determine the average annual damage. The floods of record were tabulated in chronological order noting the date and stage of each flood. The interval between floods each year was analyzed because it affects damages. If more than one flood occurred in the spring, the interval between them had to be long enough to permit replanting before the second one was counted. If a flood destroyed crops in the summer, it was assumed that a complete loss had occurred and no other crop damage occurred until the time for planting fall crops. Only one flood was used to estimate crop damage during the winter season. The total crop damage estimated for all selected floods was divided by the number of years of record to obtain the average annual crop damage for the zone. A unit damage per acre was obtained by dividing the computed average annual damage by the acres under the area-frequency curve for conditions with Dalton Reservoir represents the reduced acreage that, on the average, would still be flooded annually. Multiplying the reduced acreage by the per acre damage results in the average annual value of the remaining flood losses. The difference between the annual values for existing and improved conditions is the average annual crop damage reduction benefits from Dalton Reservoir. Table 8-29 includes a summary, by zone, of average annual flood damage to crops.

<u>Average Annual Noncrop Damage</u>. Average annual damages other than to crops were computed by use of the frequency-damage method, In this method, annual losses are derived by relating damage data from stage-damage curves with comparable frequency data from stage-frequency curves. A summary of average annual noncrop losses, by zone and category of property, is included in table 8-30.

Noncrop farm damage. - This category includes damages to argicultural properties other than crops, i.e., farm buildings, farm machinery, lands, livestock, fences, and various related items. Estimates of loss are based on field surveys of actual and synthetic flood damages over the range of flooding. From these data, noncrop damage-frequency curves were developed for each zone for conditions with and without Dalton Reservoir. The curves for the Resaca reach presented as exhibit 8-33 exemplify the results of the procedure.



① AREA-FREQUENCY RELATIONSHIP WITH CARTERS DAM IN OPERATION

② REVISED WITH CARTERS AND DALTON DAMS IN OPERATION

COMPREHENSIVE PLAN OF DEVELOPMENT FOR WATER RESOURCES IN THE APPALACHIAN REGION

AREA - FREQUENCY CURVE

(CLEARED LAND)

RESACA REACH
OOSTANAULA RIVER

EXHIBIT 8-32

TABLE 8-29
AVERAGE ANNUAL FLOOD DAMAGES TO 1967 DEVELOPMENT IN STUDY AREA

NOTE. - Amounts, in thousand dollars, are based on 1967 prices and the protection by Carters and Allatoona Reservoirs

Damage zone with Control point	Damage categories: Agricultural: Crops	Agricultural: Other farm property	Roads and railroads	Urban	All damages
Conasauga River:					
A-B, Tilton	46.0	14.3	8.8	0	69.1
Oostanaula River:					
B-C, Resaca	50.1	13.7	2.4	1.4	67.6
C-D, Bells Ferry	68.6	23.9	14.0	0	106.5
Coosa River:					
D-E, Rome	0	0	0	19.6	19.6
E-F, Mayos Bar	52.5	30.8	1.3	0	84.6
Total	217.2	82.7	26.5	21.0	347.4

Urban flood losses. - Flood damage surveys were also made in each urban center affected by flooding in the study area. During the surveys, representatives of public, commercial, and industrial establishments were contacted to obtain information pertaining to estimates of flood damages. Residential properties were sampled for similar estimates. Recent street and utility damage data were obtained through interviews with appropriate local officials. All information was adjusted to reflect current values and development and served as basis for constructing two damage-frequency curves for each urban area: one for conditions without Dalton Reservoir, the other for conditions modified by the reservoir. The curves for the Resaca reach are presented in exhibit 8-34.

Transportation route damages. - Evaluation of flood damages to roads and railroads is based on interviews with county and State road officials and pertinent data gathered in previous surveys. The damage-frequency curves in exhibit 8-35 exemplify the curves derived for all five damage zones.

Intangible and Unevaluated Flood Losses. - Intangible damages are not adaptable to monetary measurement, but they are of considerable importance. The danger of life and the spread of disease is always a possibility where flooding occurs. Prolonged periods of inundation cause interruption of transportation, communications, and utility service which has a widespread economic effect, but present procedures include no

workable provisions for their evaluation. However, in making final project formulation decisions concerning reservoir flood storage, public health, safety, security, and the general welfare were major factors considered besides the reduction in primary tangible damages.

Flood Control Benefits

Total Flood Damage Reduction Benefits. - Table 8-30 presents, by damage zones, (a) the average annual flood damages to all development, present and future, expected in the absence of further flood control measures: (b) the average annual damage that would remain with Dalton Reservoir built as recommended; and (c) the difference between the two amounts, which is the expected damage reduction, or the benefits, due to the project installation.

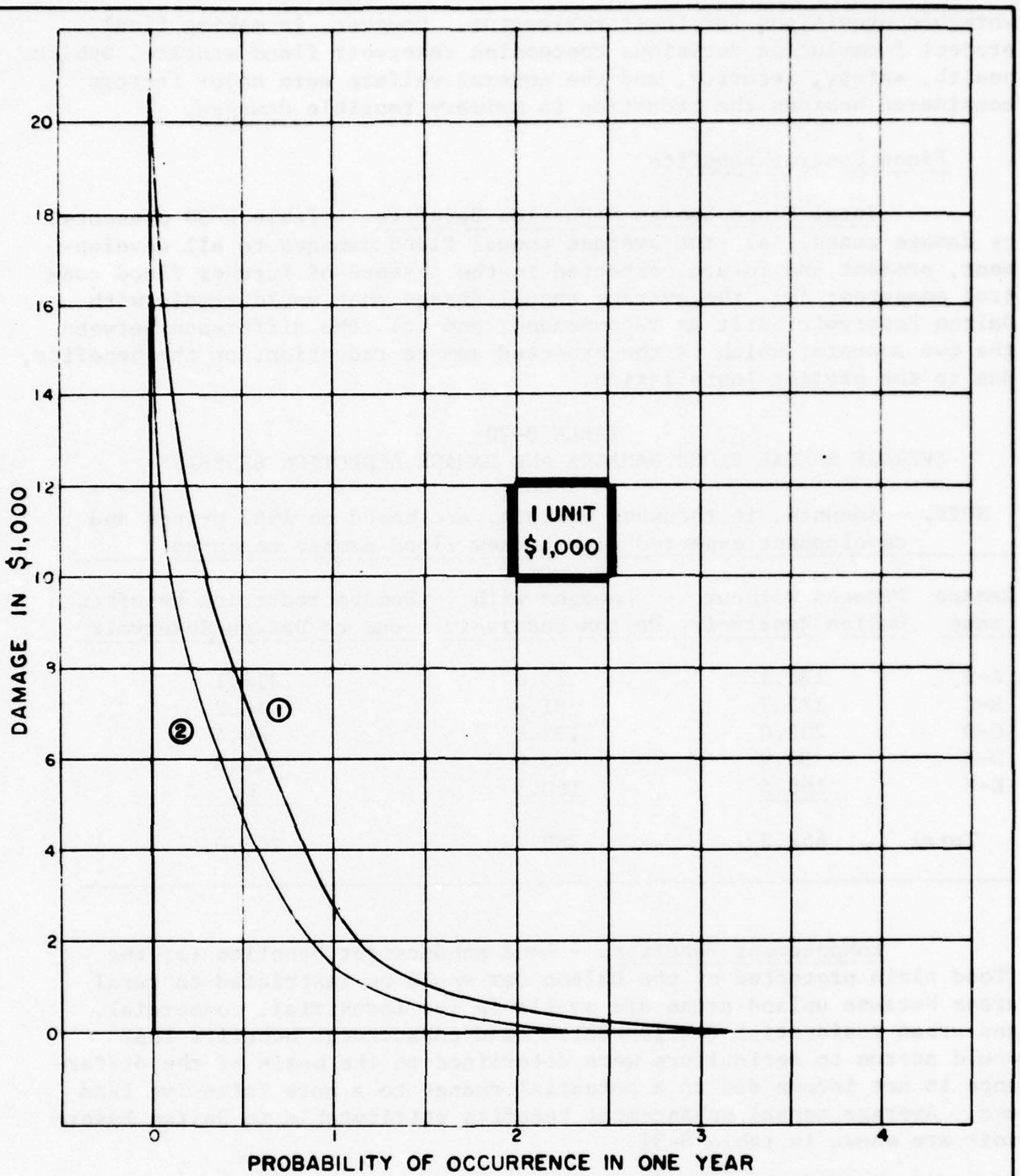
TABLE 8-30
AVERAGE ANNUAL FLOOD DAMAGES AND DAMAGE REDUCTION BENEFITS

NOTE. - Amounts, in thousand dollars, are based on 1967 prices and development expected with no new flood damage measures

Damage zone	Damages without Dalton Reservoir	Damages with Dalton Reservoir	Damage reduction benefits due to Dalton Reservoir
A-B	131.1	13.0	118.1
B-C	127.7	81.5	46.2
C-D	202.0	132.6	69.4
D-E	30.9	1.6	29.3
E-F	160.5	160.5	0
Total	652.2	389.2	263.0

Enhancement Benefits. - Land enhancement benefits for the flood plain protected by the Dalton Dam would be restricted to rural areas because upland areas are available for industrial, commercial, and urban residential development. Land enhancement benefits that would accrue to agriculture were determined on the basis of the difference in net income due to a potential change to a more intensive land use. Average annual enhancement benefits attributable to Dalton Reservoir are shown in table 8-31.

Present Benefits. - Present flood control benefits are measured as the difference in flood damages to existing development under present conditions of flooding and improved conditions with the proposed project in operation. Table 8-32 includes a summary of present rural and urban flood control benefits expected with the proposed Dalton Dam in operation.



NOTE:

Price level July 1967.

① DAMAGE-FREQUENCY RELATIONSHIP WITH CARTERS DAM IN OPERATION

② REVISED WITH CARTERS AND DALTON DAMS IN OPERATION

COMPREHENSIVE PLAN OF DEVELOPMENT FOR WATER RESOURCES IN THE APPALACHIAN REGION

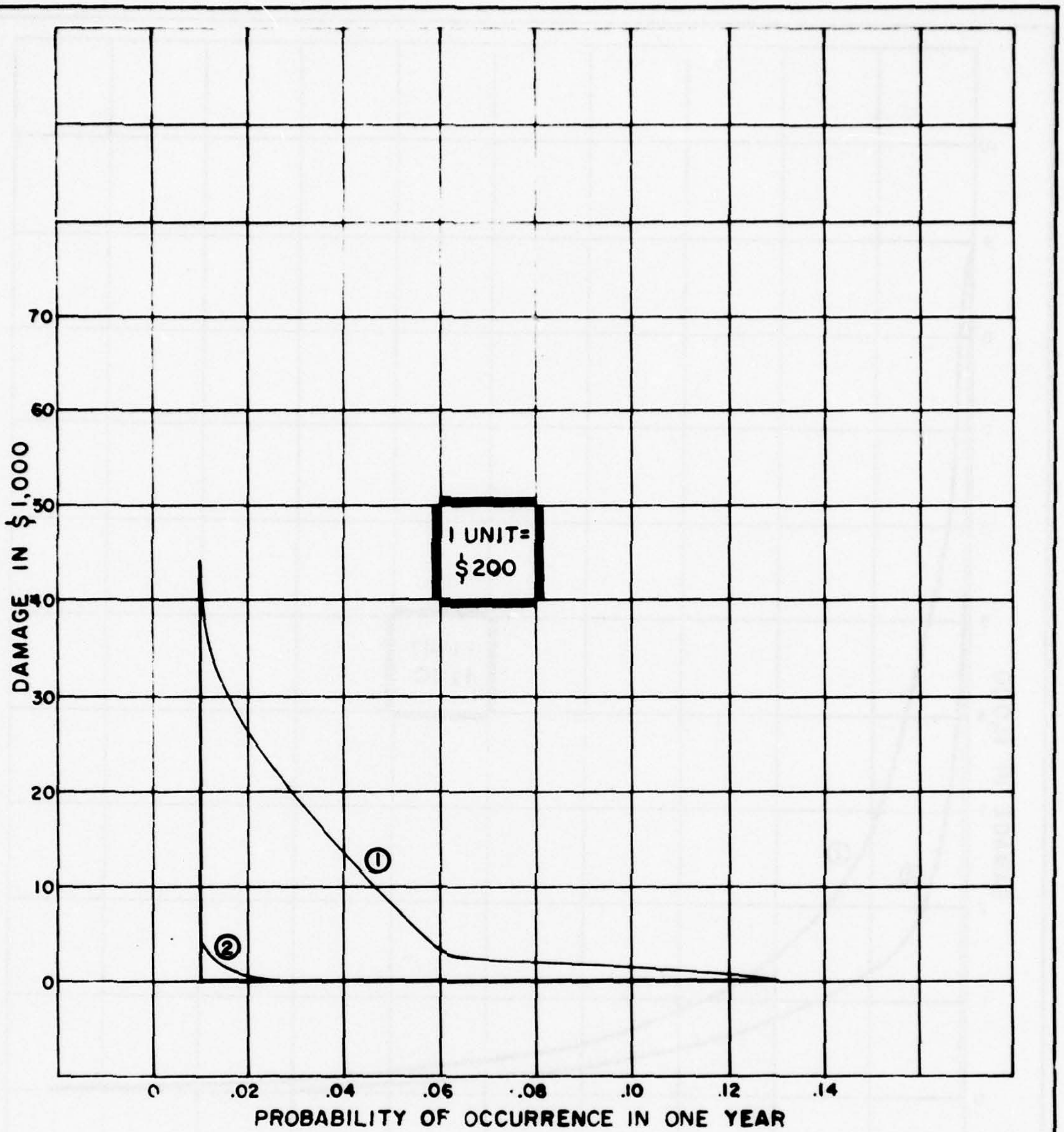
NON-CROP

DAMAGE - FREQUENCY CURVE

RESACA REACH

OOSTANAULA RIVER

EXHIBIT 8-33



NOTE:

Price level July 1967

① DAMAGE-FREQUENCY RELATIONSHIP WITH CARTERS DAM IN OPERATION

② REVISED WITH CARTERS AND DALTON DAMS IN OPERATION

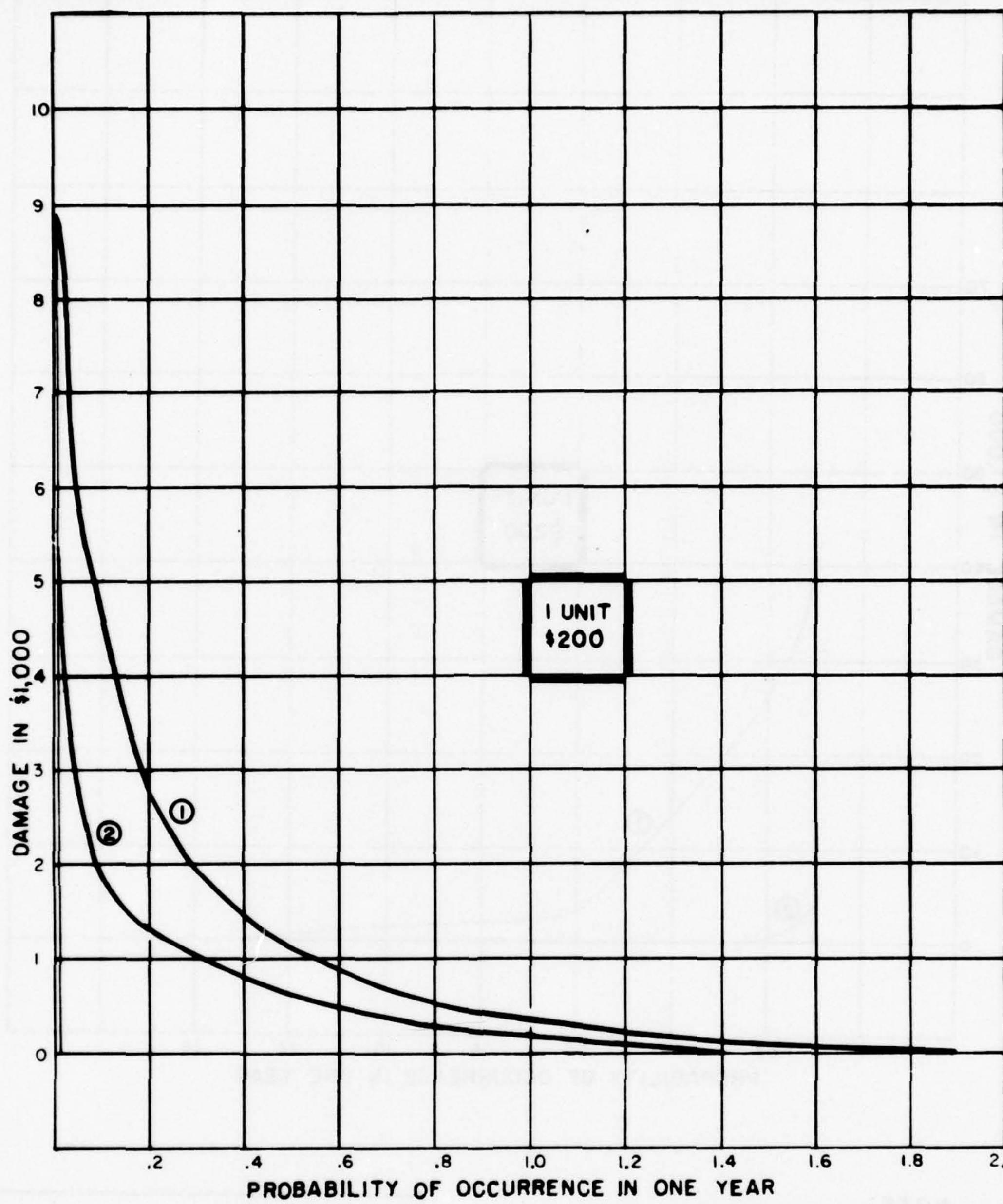
COMPREHENSIVE PLAN OF DEVELOPMENT FOR WATER RESOURCES IN THE APPALACHIAN REGION

DAMAGE - FREQUENCY CURVE

(URBAN)

CALHOUN, GEORGIA

EXHIBIT 8-34



NOTE:

Price level July 1967.

① DAMAGE-FREQUENCY RELATIONSHIP WITH CARTERS DAM IN OPERATION

② REVISED WITH CARTERS AND DALTON DAMS IN OPERATION

COMPREHENSIVE PLAN OF DEVELOPMENT FOR WATER RESOURCES IN THE APPALACHIAN REGION

DAMAGE - FREQUENCY CURVE
(ROADS AND RAILROADS)

RESACA REACH
OOSTANAULA RIVER

EXHIBIT 8-35

TABLE 8-31

AVERAGE ANNUAL RURAL LAND ENHANCEMENT BENEFITS FROM DALTON RESERVOIR

NOTE. - Benefit amounts, in thousand dollars, are based on 1967 prices and development

	Damage zone A-B	B-C	C-D	D-E	E-F	Total
Cleared area:						
Acres	3,413	1,436	2,060	0	0	6,909
Benefits	28.3	7.5	9.6	0	0	45.4
Woods:						
Acres	729	434	775	0	0	1,938
Benefits	17.8	17.2	14.6	0	0	49.6
Total, benefits	46.1	24.7	24.2	0	0	95.0

TABLE 8-32

SUMMARY OF AVERAGE ANNUAL FLOOD CONTROL BENEFITS FROM DALTON RESERVOIR

Benefit Class	1967 prices and development	1967 prices and 1975 development	Average annual increment[1] of increase 1975 - 2020	Total average annual benefits
Damage reduction:				
Urban	$20,000	$21,900	$9,600	$31,500
Rural[2]	122,000	169,000	62,500	231,500
Total	142,000	190,900	72,100	263,000
Land enhancement:				
Urban	0	0	0	0
Rural	95,000	131,600	48,700	180,300
Total	95,000	131,600	48,700	180,300
Grand total	237,000	322,500	120,800	443,300

1/ 50-year development in flood plain discounted at 3.25 percent over a 100-year project life.

2/ Includes benefits to transportation routes.

Benefits to Future Development. - Additional benefits will accrue from the proposed project as a result of future increases in agricultural productivity and normal future development expected in the flood plain in the absence of the project. Estimates of added agricultural productivity are based on relevant projections made by Auburn University for a seven-county area which includes most of the study area. These projections were used in preference to the more general information in the economic base study for Appalachia. Growth in the urban areas was determined on the basis of future population projected for the Rome SMSA by the University of Alabama. Table 8-32 includes a summary of estimated benefits expected to accrue from the Dalton Reservoir project to future increments of rural and urban development in the flood plain below the dam.

Summary of Flood Control Benefits. - The following table summarizes all primary monetary benefits attributable to the flood control function of the proposed Dalton Reservoir project. Considerable intangible benefits would also arise from installation of the project but they are not reflected in the table; neither are the secondary monetary benefits which would accrue to the economy from reducing the frequency and severity of flooding in the study area.

Recreation

The Bureau of Outdoor Recreation analyzed the needs, present and future, of the population in the recreation market area around Dalton as well as the recreation potential of the proposed reservoir project. The report of the Bureau, part of Appendix F, concludes that, with a minimum development for general outdoor recreation at the project, there would be an average annual use of 150,000 recreation-days. However, with the first phase of recreational development installed as planned, initial visits would amount to 368,000 annual user-days. The ultimate development for recreation, when completed by about 1990, would result in an increase to 2,180,000 annual user-days. With a benefit value of $1.25 per user-day, average annual equivalent benefits stemming from the general outdoor recreational opportunities to be provided at Dalton Reservoir are estimated at $1,762,000.

The Environmental Resources Branch of the Ohio River Division, Corps of Engineers, developed a set of curves to evaluate the growth characteristics of recreation visitation development at projects in the Ohio River Division. This set of curves was furnished by the Office of Appalachian Studies for use in the project formulation associated with the preparation of this report. Curve Number 2 of this set was considered appropriate for estimating the recreation benefits of Dalton Reservoir herein, whereas Curve Number 3 was used in the preparation of Appendix F.

The Bureau of Sport Fisheries and Wildlife evaluated the effects of the potential reservoir project on fishery and wildlife resources in the area. Their report, included in Appendix G, indicated that a total of 10,725 acres of wildlife habitat would be lost due to the installation of the project. As a result, about 4,300 annual hunter-days would be eliminated. Mitigation measures under the plan, however, would provide 6,300 acres of intensively managed waterfowl and other game habitat, and this area, together with 3,400 acres of project lands, would nearly compensate for the project-occasioned loss in hunting opportunities. Table 8-33 gives a detailed account of relevant benefits and detriments that would arise from Dalton Reservoir's installation.

An estimated 3,600 man-days of stream fishing would be lost by inundating the reservoir area. Fishery resources, however, would be greatly improved by the Dalton Reservoir project, resulting in a net gain of 186,700 annual angler-days in the potential reservoir area. In addition, improved stream conditions below the dam and provision of access sites with parking facilities along the 25-mile Conasauga River reach to the mouth would provide new opportunities for stream fishing, estimated at 5,135 angler-days annually. The average annual benefit arising from fishery enhancement due to the project is estimated at about $193,000. Opportunities for waterfowl hunting will provide an annual benefit of $3,000.

The total recreation benefits, both from new general outdoor recreation opportunities and fish and wildlife enhancement provided by the Dalton Reservoir project, are almost $1.96 million annually.

Table 8-34 includes a summary of user benefits.

TABLE 8-34
SUMMARY OF USER BENEFITS, DALTON RESERVOIR, GA.

Item	Amount ($1,000)
Flood Control	443
Water Supply	195
Water Quality Control	163
Recreation	1,958
Total	2,759

TABLE 8-33

ANALYSIS OF GENERAL RECREATION, FISHING, AND HUNTING ACTIVITY-DAYS AND THEIR VALUE

	Average annual activity-days							
			With Dalton Reservoir project					
		Without Dalton Reservoir project	Initial development			Future increment		Total benefit or loss, rounded
				Gain or loss		Additional gain		
	Unit value		Gross number	Number	Value	Number	Discounted value	
General recreation	$1.25	0	368,000	+368,000	+$460,000	1,812,000	$1,302,000	+$1,762,000
Fishing:								
Stream fishing:								
In potential reservoir area		3,600	0	-3,600				
In 25-mile reach below dam		1,125	6,260	+5,135				
Total	1.65	4,725	6,260	+1,535	+2,533			
Reservoir fishing:								
In potential reservoir area	1.00	0	190,300	+190,300	+190,300			
Grand total, fishing		4,725	196,560	+191,835	+192,833			
Rounded		___	197,000	___	+193,000			+193,000
Hunting:								
Small- and upland-game	3.25	6,160	6,020	-140	-455			
Big-game	6.00	1,640	1,060	-580	-3,480			
Subtotal		7,800	7,080	-720	-3,935			-4,000
Waterfowl	5.00	0	620	+620	+3,100			+3,000
Total		7,800	7,700	-100				

20. EXPANSION

Expansion benefits expected from the Dalton Reservoir project are divided into two categories, redevelopmental and developmental. Redevelopmental benefits consist of wages and salaries paid for constructing, operating, and maintaining the water resource project. Developmental benefits credited to the project are the wage and salary payments to persons not directly associated with the project, but whose employment would be a result of the economic activity induced by the project.

Redevelopmental Benefits

Two of the five counties comprising the area of prime project impact have a substantial and persistent unemployment rate and are designated as redevelopment areas under Public Law 89-136. Murray and Walker Counties have about 520 unemployed males, including 430 experienced craftsmen and laborers, based on the 1960 Census. Under study criteria, this designation is applicable to all five counties since they lie within the Appalachian Region.

Redevelopmental benefits credited to the regional account consist of the average annual equivalent of all labor cost for building, operating, and maintaining the proposed water resource project. The national account is credited with that part of the labor cost which includes the payments to persons who live within commuting distance of the project and would be unemployed or underemployed in the absence of the project and who possess the necessary skills for project construction and operation.

Detailed analysis of construction costs of various reservoirs indicate labor cost to be about 20 percent of construction costs, less lands and damages, and about 70 percent of annual operation and maintenance expenditures. Further analysis was made to determine the degrees of skill required for project construction and operation and what portion of these labor skills could be furnished from the locally unemployed and underemployed. Based on this factors were derived for application to project labor costs to obtain the respective redevelopment benefits creditable to he national and regional accounts. The results of these studies are presented in table 8-35.

TABLE 8-35
DISTRIBUTION OF LABOR, BY SKILL LEVEL, REQUIRED FOR CONSTRUCTING, OPERATING, AND MAINTAINING *DALTON RESERVOIR*

Project phase and labor skill level	Share of labor required at skill level (percent)	Locally supplied portion of required share (percent)	Redevelopment benefit factors National account	Redevelopment benefit factors Regional account
Construction:				
Skilled	50	10	0.05	0.50
Semiskilled	20	25	.05	.20
Unskilled	30	100	.30	.30
Total	100		.40	1.00
Operation and maintenance:				
Skilled	38	10	0.04	0.38
Semiskilled	28	25	.07	.28
Unskilled	34	100	.34	.34
Total	100		.45	1.00

The evaluation of redevelopment benefits using the factors in the preceeding table is presented in table 8-36.

TABLE 8-36
REDEVELOPMENT BENEFITS, IN THOUSAND DOLLARS, FROM DALTON RESERVOIR, GA.

Project phase	Expenditure 1/	Labor cost 2/	Annual benefits National account 3/	Annual benefits Regional account 4/
Construction:				
Initial	26,210	5,242	71	176
Future	4,110	822	1	14
Total	30,320	6,064	72	190
Annual operation and maintenance:				
Initial	208	146	19	146
Future	183	128	13	128
Total	391	274	32	274
Grand total, benefits			104	464

1/ Excludes costs for lands and damages; engineering and design; and supervision, inspection, and overhead.

2/ 20 percent of construction amounts and 70 percent of operation and maintenance amounts.

3/ Using the appropriate redevelopment benefit factor and assuming an accelerated growth for future expenditures, future benefits reflecting a 20-year time horizon are discounted at an annual 3.25-percent rate.

4/ Future expenditures, growing at an accelerated rate, are discounted at an annual 3.25-percent rate.

Developmental Benefits

The area development plan described in paragraph 17 contains the basic data for determining the developmental expansion benefits that would accrue to the Nation and the region due to Dalton Reservoir's economic effect. For the purposes of this report, the benefits are measured in terms of salary and wage payments. The national account is credited with those payments which are net efficiency gains for the Nation, i.e., they are attributable to the work of unemployed and underemployed who find employment in the developing economy stimulated by the investment plan. To calculate the benefits assignable to the regional account, it was necessary to estimate how much of the labor force would need to be imported or hired from the gainfully employed. Management personnel would most likely be imported or hired from those now locally employed, principally in the textile industry. The semiskilled and unskilled workers comprise the major categories to be recruited from the ranks of the area's unemployed and underemployed to 1990. After that, the employed are expected to be 4 percent, or less, of the labor force, and it is assumed that they would not satisfy the labor needs.

Tables 8-37 and 8-38 present recent distribution of unemployment and underemployment in the five-county area of prime project impact.

TABLE 8-37
EMPLOYMENT CONDITIONS, 1960-66, IN DALTON AREA
WHITFIELD, MURRAY, GORDON, WALKER, AND CATOOSA COUNTIES

	Labor force			
			Unemployed	
Year	Total (number)	Employed (number)	Number	Percent of total force
1960	43,060	39,780	3,280	7.6
1961	NA	NA	NA	NA
1962	43,740	39,300	4,440	10.15
1963	43,610	40,140	3,470	7.96
1964	45,230	42,690	2,540	5.62
1965	48,140	45,820	2,320	4.82
1966	51,170	49,040	2,130	4.16

NA - Not available.

TABLE 8-38

UNDEREMPLOYMENT AND UNEMPLOYMENT IN DALTON AREA, 1966

County	Households (number)	Households in poverty class: Nonfarm, with annual income less than $3,000 (number)	Households in poverty class: Farm, with annual income less than $2,500 (number)	Households in poverty class: Total (number)	Households in poverty class: Share of all households (percent)	Unemployed persons (number)
Whitfield	14,400	2,850	30	2,880	20.0	950
Murray	3,200	806	77	883	27.6	180
Gordon	5,900	1,550	150	1,700	28.8	310
Walker	14,600	3,140	145	3,285	22.5	590
Catoosa	6,300	1,110	30	1,140	18.1	100
Total	44,400	9,456	432	9,888	22.27	2,130

TABLE 8-39

HISTORICAL AND PROJECTED EMPLOYMENT AND POPULATION IN FIVE-COUNTY DALTON AREA

	1940	1950	1960	1980 OBE	1980 Benchmark	2000 OBE	2000 Benchmark	2020 OBE	2020 Benchmark
Employment:									
All industries	35,713	42,450	50,259	79,000	80,954	131,000	139,093	202,000	216,031
Nonmanufacturing	22,055	23,236	25,029	38,700	39,972	72,200	76,202	115,800	124,141
Manufacturing	13,658	19,214	25,230	39,300	40,982	58,800	62,891	86,200	91,890
Food	209	473	1,141	2,100	2,170	3,400	3,575	4,400	4,650
Chemicals	115	304	512	1,100	1,125	2,000	2,075	3,400	3,591
Textiles	6,625	10,489	13,876	22,000	22,960	32,000	34,467	43,000	45,845
All other	6,709	7,948	9,701	14,100	14,727	21,400	22,774	35,400	37,804
Population	98,909	117,374	138,149	214,000	219,300	346,000	367,900	515,000	550,000
Population per worker	2.8	2.8	2.8	2.7	2.7	2.6	2.6	2.5	2.5

The five-county Dalton area is part of Economic Sub-region 21 of the Appalachian Region. The Sub-region, comprised of 30 counties in Georgia, Tennessee, and Alabama, is shown in figure 1 of Appendix E: Economic Base Study. Estimates of future employment in the Dalton area were derived by disaggregating the following two sets of projections (contained in Appendix E) made for Sub-region 21: (a) Projections by the Office of Business Economics and (b) developmental benchmark projections by the Office of Appalachian Studies. Disaggregation results, grouped by two-digit Standard Industrial Categories (SIC), were analyzed for each decade and modified where judgment dictated. Increasing labor productivity was recognized as a factor in determining projected employment in the area based on forecast industry output. Table 8-39 presents past data and projections on employment and population in the Dalton area.

This study, however, concerns itself with only that part of the area's total projected employment increases which would be directly attributable to the economic effect of the reservoir project. Accordingly, the proportion of manufacturing employment, by categories, which could reasonably be directly related to the reservoir was determined. Related service and commercial employment increases were calculated by applying a multiplier of 0.82 to the project-occasioned manufacturing employment. The multiplier was taken from an ARC report on a study of economic relationships in the area as related to recreation. The following table summarizes, by decade, the results of the analysis.

TABLE 8-40
PROJECTED CUMULATIVE EMPLOYMENT INCREASES DUE TO COMPLETED DALTON RESERVOIR

Industry category	1970	1980	1990	2000	2010	2020
Manufacturing	0	1,350	4,290	9,230	14,100	16,595
Commercial and service	0	1,107	3,518	7,568	11,562	13,658
Total	0	2,457	7,808	16,798	25,662	30,253

To develop an estimate of the wage bills which serve as direct measures of developmental benefits, three sets of analyses were performed:

(a) The skill level requirements for the area's manufacturing and service industries were estimated, by decade, to the year 2020.

(b) The number of employees which could reasonably be expected to be hired from the underemployed and unemployed in the five-county labor-shed led to the remaining number of employees needed to fill the job requirements. This need is expected to be met by persons hired from outside who would move into the area and by local residents who, though gainfully employed, would take advantage of the new job opportunities brought about by the water resource project's installation. Since full employment is defined in part as having an unemployment rate of 4 percent or less, future numbers of unemployed were reduced by 4 percent of the labor force, and only the rest was considered available for the new job opportunities. Underemployed families are defined as those nonfarm and farm families who have an annual income of less than \$3,000 and \$2,500, respectively.

(c) Employee wages were computed, by skill level, for each decade to year 2020.

The analyses were performed in stages: Determination of the nature of skill levels in the current labor force and the aptitude for training determination of skill levels required by the 39 SIC manufacturing industries considered to be most likely attracted to the area in the future; determination of skill levels needed by service industries; an estimate of the number of workers to be supplied from the area and to be imported; and finally, a multiplication of current wage rates by the various skill level magnitudes to establish the wage bill. In order to project this information at a future decade to reflect future real wages brought about by increases in productivity, wages were increased by a compound rate of 2 percent. These benefits are summarized in table 8-41.

TABLE 8-4
CUMULATIVE NATIONAL - REGIONAL
DALTON RESERVO

	1980		1990	
Imported or Presently Gainfully Employed	Employees	Real Wages	Employees	Real Wa
Manufacturing, Management	112	$ 1,506,793	356	$ 5,838,
Manufacturing, Skilled	245	1,861,966	877	8,132,
Manufacturing, Semi-skilled	117	576,779	926	5,586,
Service, Management	111	1,194,672	352	4,618,
Service, Skilled	166	1,073,267	616	4,849,
Service, Semi-skilled	44	175,817	703	3,403,
Manufacturing, Unskilled			221	1,150,
Service, Unskilled			176	735,
Total	795	$ 6,389,294	4,227	$34,313,
Locally Hired From Un-and Underemployed				
Manufacturing, Skilled	61	$ 465,491	97	$ 903,
Manufacturing, Semi-skilled	466	2,307,115	927	5,586,
Manufacturing, Unskilled	349	1,487,420	886	4,600,
Service, Skilled	111	715,512	264	2,078,
Service, Semi-skilled	399	1,582,355	704	3,403,
Service, Unskilled	276	946,858	703	2,940,
Total	1,662	$ 7,504,751	3,581	$19,513,
Total Imported and Locally Hired	2,457	$13,894,045	7,808	$53,827,

	National Account	Regional Account	National Account	Regio Accou
Imported Labor	$ 0	$ 6,389,294	$ 0	$34,313
Locally Hired Labor	$7,504,751	$ 7,504,751	$19,513,400	$19,513
Total	$7,504,751	$13,894,045	$19,513,400	$53,827

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TABLE 8-41

TIVE NATIONAL - REGIONAL EMPLOYMENT WAGE BENEFITS

DALTON RESERVOIR, GA.

	1990		2000		2010		2020	
ges	Employees	Real Wages	Employees	Real Wages	Employees	Real Wages	Employees	Real Wages
,793	356	$ 5,838,312	766	$15,313,264	1,170	$28,511,928	1,378	$40,934,705
,966	877	8,132,637	2,095	23,689,580	3,201	44,122,818	3,767	63,297,292
,779	926	5,586,658	3,987	29,305,909	6,091	54,576,460	7,169	78,302,624
,672	352	4,618,170	757	12,106,675	1,156	22,536,608	1,366	32,462,587
,267	616	4,849,078	1,892	18,155,214	2,891	33,816,609	3,414	48,679,622
,817	703	3,403,482	3,027	17,851,448	4,625	33,248,685	5,463	47,873,553
	221	1,150,181	2,382	15,082,766	3,638	28,081,325	4,281	40,280,878
	176	735,185	1,892	9,644,958	2,890	17,958,859	3,415	25,868,624
,294	4,227	$34,313,703	16,798	$141,149,814	25,662	$262,853,292	30,253	$377,699,885
,491	97	$ 903,626	0		0		0	
,115	927	5,586,658	0		0		0	
,420	886	4,600,720	0		0		0	
,512	264	2,078,177	0		0		0	
,355	704	3,403,482	0		0		0	
,858	703	2,940,737	0		0		0	
,751	3,581	$19,513,400	0		0		0	
,045	7,808	$53,827,103	16,798	$141,149,814	25,662	$262,853,292	30,253	$377,699,885
nal nt	National Account	Regional Account	National Account	Regional Account	National Account	Regional Account	National Account	Regional Account
294	$ 0	$34,313,703	$ 0	$141,149,814	$ 0	$262,853,292	$ 0	$377,699,885
751	$19,513,400	$19,513,400	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
045	$19,513,400	$53,827,103	$ 0	$141,149,814	$ 0	$262,853,292	$ 0	$377,699,885

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The nature of the current labor force was determined by interviews and correspondence with State and local Georgia Department of Labor officials. These revealed that 4.16 percent of the labor force was composed of unemployed in the five-county area, though this percentage fluctuated in each county. In 1966 there were approximately 2,200 persons unemployed and actively seeking work within the project area. These unemployed were divided almost evenly between male and female and were predominately classed as semi-skilled workers, and readily trainable. Approximately 1 out of every 2 workers in the area was employed in manufacturing and about 70 percent of the manufacturing employment was accounted for by the textile industry.

The skill levels needed by the manufacturing industries were determined by obtaining the average number of employees for an average plant in each industry divided into the categories of management, skill labor, semi-skill labor and unskilled labor. Service employment skills were divided into these same categories. The skill levels were then applied to the project manufacturing and service employment for the Dalton area and the results are presented in table 8-42.

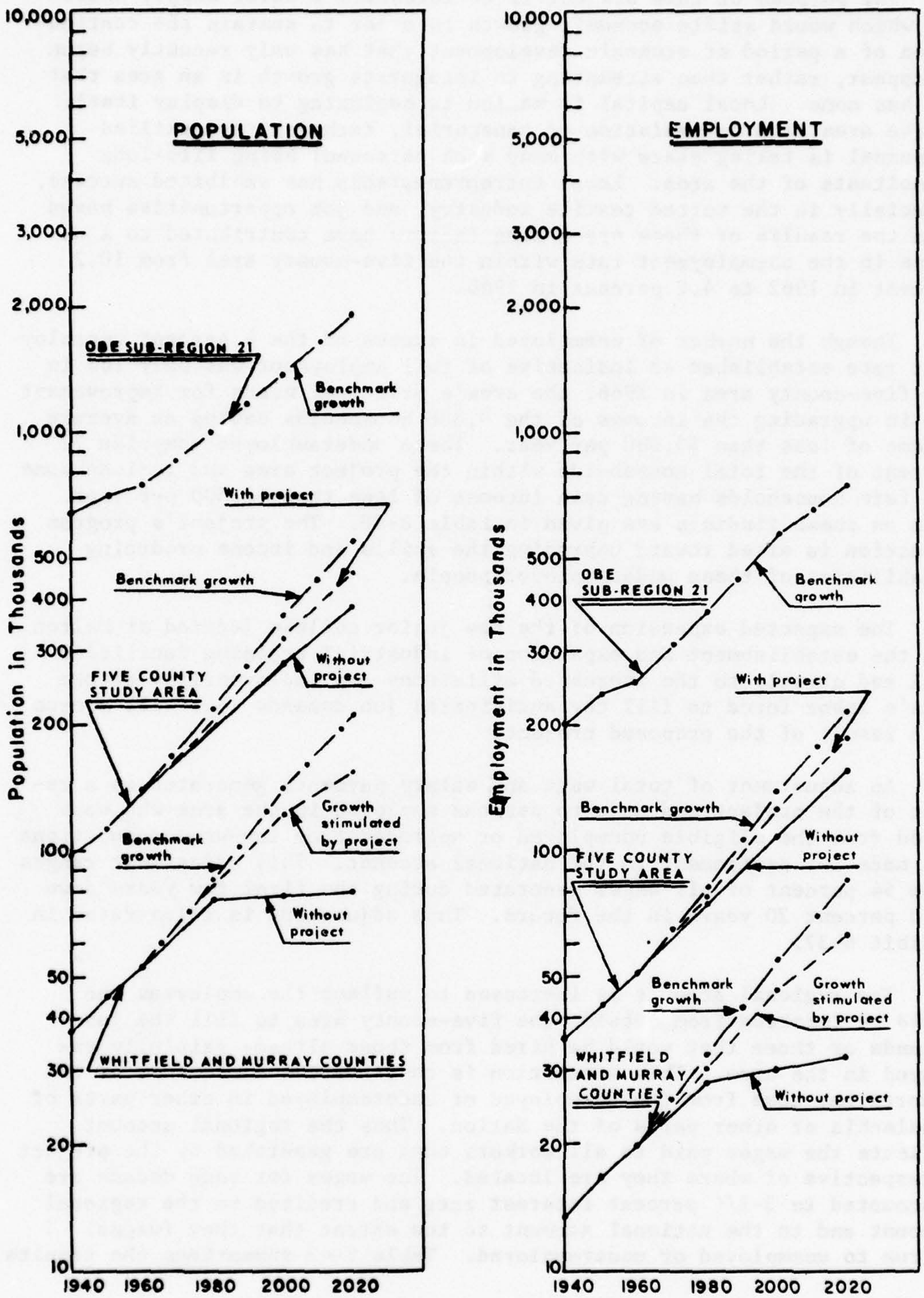
TABLE 8-42
EMPLOYMENT BY SKILL LEVEL

		Manufacturing			
Year	Total	Management (8.3%)	Skilled (22.7%)	Semi-skilled (43.2%)	Unskilled (25.8%)
1980	1,350	112	306	583	349
1990	4,290	356	974	1,853	1,107
2000	9,230	766	2,095	3,987	2,382
2010	14,100	1,170	3,201	6,091	3,638
2020	16,595	1,378	3,767	7,169	4,281
		Services			
Year	Total	Management (10%)	Skilled (25%)	Semi-skilled (40%)	Unskilled (25%)
1980	1,107	111	277	443	276
1990	3,518	352	880	1,407	879
2000	7,568	757	1,892	3,027	1,892
2010	11,502	1,156	2,891	4,625	2,890
2020	13,658	1,366	3,414	5,463	3,415

The estimates of workers that would be supplied by the area and those that would be imported utilized several assumptions. Since the available unemployed and underemployed consist of unskilled, semi-skilled and skilled labor, imported labor would be primarily managerial with some skilled and semi-skilled. With increased area employment and the relatively low unemployment in the area the ratio of imported labor would increase during the second decade and after 1990 it was assumed that all labor requirements would be filled by imported and those presently gainfully employed. It is recognized some labor for particular specialized jobs may still be imported but at the same time it is expected that this importation would be offset by other factors or be very minor.

The wage bill was computed by using existing wage rates for 1967 as supplied by the Georgia Department of Labor compounded at 2 percent annually for subsequent decades and multiplied by the skill category employment for the designated decades.

Based upon an analysis of commuting patterns in the study area, it was concluded that wage payments made as a result of the project would impact upon the economies of each of these affected counties with varying degrees of importance. The improvement of the transportation network within the area will contribute to a likely increase in the number of commuters into the Dalton growth center from the other study area counties. Since Dalton is the growth center for this area, most of the wage payments attributable to the national account will be paid to commuters from Gordon, Murray, and Walker Counties where unemployment presently ranges from 4.1 percent to 7.1 percent. This conclusion is based, however, upon the assumption that the Dalton Reservoir will be constructed before the foreseen water supply shortage becomes a retarding factor upon the growth center's economic growth. If this is not accomplished, growth in the immediate Dalton area will stagnate and unemployment will rise rapidly in all the counties of the study area. While positive growth is forecast by economic base studies without the Appalachian investment program, the assumptions based upon these studies assume that factors influencing the area's historical growth will continue. But without the water supply provided by the project, even this normal growth will be sharply retarded as shown in exhibit 36. With implementation of the proposed Dalton plan, a significant increase in employment and population can be expected as a result of the stimulation brought about by the reservoir and at the same time confidence in the area's future growth can be maintained.



Comparison of Population and Employment Projections With and Without Investment Program against Benchmark Targets.

EXHIBIT 8-36

The purpose of this project is to forestall a water supply shortage which would stifle economic growth in order to sustain the continuation of a period of economic development that has only recently begun to appear, rather than attempting to inaugurate growth in an area that now has none. Local capital formation is beginning to display itself in the area, and accumulation of managerial, technical and skilled personnel is taking place with many such personnel being life-long inhabitants of the area. Local entrepreneurship has exhibited success, especially in the tufted textile industry, and job opportunities based upon the results of these preceeding factors have contributed to a decline in the unemployment rate within the five-county area from 10.2 percent in 1962 to 4.2 percent in 1966.

Though the number of unemployed in excess of the 4 percent unemployment rate established as indicative of full employment was only 168 in the five-county area in 1966, the area's principal needs for improvement lie in upgrading the incomes of the 9,888 households having an average income of less than $3,000 per year. These underemployed comprise 22 percent of the total households within the project area and include some 432 farm households having cash incomes of less than $2,500 per year. Data on these findings are given in table 8-38. The project's program of action is aimed toward upgrading the skills and income producing capabilities of these underemployed people.

The expected expansion of the new junior college located at Dalton and the establishment and expansion of industrial training facilities will add greatly to the increased efficiency and employability of the area's labor force to fill the anticipated job demands that will accrue as a result of the proposed project.

An adjustment of total wage and salary payments generated as a result of the project and made to persons employed in the area who were hired from the eligible unemployed or upgraded from low-wage occupations was made for assignment to the national account. This adjustment ranges from 54 percent of all wages generated during the first few years down to 0 percent 20 years in the future. This adjustment is illustrated in exhibit 8-37.

The regional account is increased to reflect the employees who would be imported from outside the five-county area to fill the job demands or those that would be hired from those already gainfully employed in the area. This assumption is conservative since some of the imports may come from the unemployed or underemployed in other parts of Appalachia or other parts of the Nation. Thus the regional account reflects the wages paid to all workers that are generated by the project irrespective of where they are located. The wages for each decade are discounted to 3-1/4 percent interest rate and credited to the regional account and to the national account to the extent that they (wages) accrue to unemployed or underemployed. Table 8-43 summarizes the results.

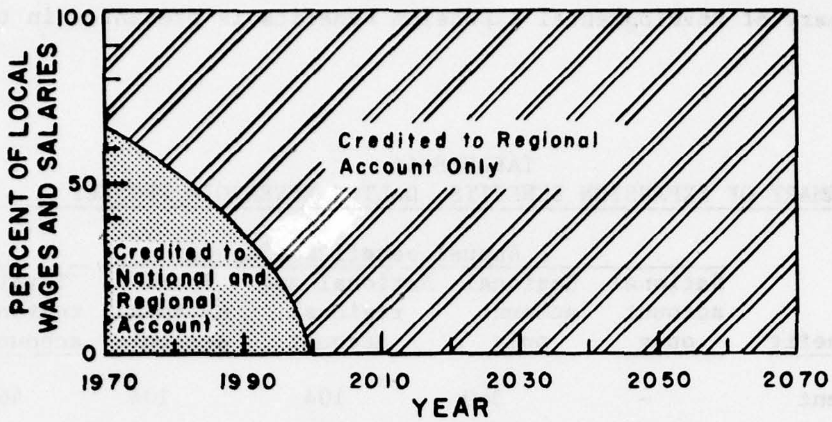


EXHIBIT 8-37 . Adjustment of Wages and Salaries for National Account.

TABLE 8-43

SUMMARY OF DEVELOPMENTAL EXPANSION BENEFITS, DALTON RESERVOIR PROJECT

Benefit	Accumulated present worth 1/	Average annual equivalent
Wages		
Hired from un- and underemployed:		
Regional account	$137,843,000	$4,670,000 2/
National account	137,843,000	4,670,000 2/
Imported or gainfully employed:		
Regional account	4,647,723	157,465,000 2/
Total regional account		162,135,000
Total national account		4,670,000

1/ Spread over life of project at 3-1/4 percent interest rate.
2/ Converted to 1975 present worth values by 3-1/4 percent compound interest factors.

A summary of developmental expansion benefits is presented in table 8-44.

TABLE 8-44
SUMMARY OF EXPANSION BENEFITS, DALTON RESERVOIR PROJECT

Type of benefit	Annual benefits ($1,000) National account only	Regional account only	National and regional account	Total national account	Total regional account
Redevelopment	-	360	104	104	464
Development:					
Wages	-	157,465	4,670	4,670	162,135
Total, expansion benefits	-	157,825	4,774	4,774	162,599

Summary of total benefits. - A summary of benefits accruing to the proposed plan of development for the Dalton area is presented in table 8-45.

TABLE 8-45
SUMMARY OF BENEFITS, SELECTED PLAN OF DEVELOPMENT, DALTON RESERVOIR

Category and class of benefits	Annual benefits ($1,000) National account only	Regional account only	National and regional account	Total national account	Total regional account
User benefits:					
Flood control and land enhancement	-	-	443	443	443
Water quality control	-	-	163	163	163
Water supply	-	-	195	195	195
Recreation	200	-	1,758	1,958	1,758
Total, user benefits	200	-	2,559	2,759	2,559
Expansion benefits:					
Redevelopment	-	360	104	104	464
Development:					
Wages	-	157,465	4,670	4,670	162,135
Total	200	157,825	4,774	4,774	162,599
Offset for secondary cost	0	- 1,800	- 700	- 700	- 2,500
Total, expansion benefits	200	156,025	4,074	4,074	160,099

SECTION VI - ECONOMIC ANALYSIS

21. ECONOMIC COST

The annual economic charges for the Dalton Reservoir project were itemized in table 8-15 (page III-8-95). The difference between the annual financial cost, $1,946,000, and the annual economic cost, $2,024,000, is attributable to the loss of productivity of the lands required for the project, inundation of existing flood control improvements in Mill Creek, and loss of hunting opportunities.

22. INDICES OF PERFORMANCE

The benefit to cost ratio which is established as an indicator of the justification for project authorization is derived by using the annual user benefits plus employment benefits of project construction and operation (redevelopment benefits) as the numerator and project economic cost as the denominator. This is considered as the minimum index of performance for augmentation of national income, and is computed as follows:

$$\frac{\$2,863,000}{2,024,000} = 1.4$$

The index of performance to indicate the effect of the developmental investment attributable to the project on regional income expansion was determined by using as the numerator the annual income flows to the region generated by construction and operation of the project and by the associated developmental investment, and the equivalent economic costs as the denominator. The result is as follows:

$$\frac{\$160,099,000}{72,892,000} = 2.2$$

23. COST ALLOCATION

General

The separable-costs-remaining-benefits method was used to allocate costs. Regional expansion benefits from the developmental plan were introduced as a purpose.

Alternative Costs

The costs of the most efficient single-purpose alternative projects were used as benefits limits. (See table 8-46, page III-8-150). Location and features of these projects are described below:

Flood Control

The selected project site at mile 24.8 on the Conasauga River can provide a higher degree of runoff control for protection of downstream rural areas and urban centers at Calhoun and Rome at less cost than any single site or combination of sites studied for plan formulation. Therefore, the costs were developed for a single-purpose flood control project at this site and used in the cost allocation studies of the Dalton Reservoir.

Water Quality Control

A study of potential single-purpose reservoir project sites in the Dalton area, ground water development, stream diversion and tertiary treatment facilities found the least costly means of providing an acceptable quality of water in the Conasauga River to be tertiary treatment. Therefore, facility cost to provide the treatment to meet the needs as identified for 2020 was developed and used in the cost allocation studies.

Water Supply

A study of the Dalton water supply sources on a with-and-without basis found that a raw water pumping plant and transmission system from the Coosawattee River south of town would cost less than reservoir storage with pumping therefrom, ground water development or any other sources investigated. Reservoir sites with potential for gravity flow to the water purification plant are not available. The cost of a pumping system was developed and used in the cost allocation studies.

Recreation

State parks provide a significant number of water related outdoor recreation opportunities. The costs incurred by the state park systems for provision of generally equivalent recreation opportunities are utilized as appropriate alternative costs since single-purpose reservoir and related land development projects investigated for this study were found to be more costly. Derivation of these costs is as follows:

Recreational area:	
Specific-use lands (acres)	2,000
Joint-use lands (acres)	3,600
Pool area (acres)	8,650
Total, recreational area	14,250
Average visitation:	
General (2,180,000x0.7981)	1,739,900
Fish	192,600
Total, average visitation	1,932,500

Average visit per acre =	136
Annual charges per visitor day (1960 prices)	$0.71
Annual charges per visitor day (July 1967 prices)	0.94

Average annual alternative charges:	
2,180,000x$0.94x0.6466	1,325,000
192,600x$0.94	181,000
Total	1,506,000

Regional expansion. - Alternative costs for regional expansion are assumed equal to the total developmental plan including the multiple-purpose project costs.

Separable Costs

Separable costs are those additional costs incurred in adding each purpose to the project. They are derived by computing the savings which would accrue if each purpose were individually omitted from the project while benefits to the other purposes are maintained.

Flood control. - A reservoir without primary flood storage above the seasonal recreation pool would provide equivalent benefits for the other purposes.

Water Quality and Water Supply

There are no separable cost attributable to water quality or water supply. A reduction of storage would reduce recreation benefits.

Recreation. - The seasonal storage allotment for recreation was omitted. Specific use recreation lands and facilities were omitted. The resulting project would provide equivalent benefits for the other purposes.

Regional expansion. - No separable costs are attributable to regional expansion.

Restricted Joint Costs

The costs of adding storage for water quality and water supply were distributed to water quality, water supply, and recreation since these purposes share a beneficial effect from the storage.

Joint Costs

Those costs remaining after allocation of separable and restricted joint costs were distributed on the basis of the ratio of remaining benefits.

Allocated Operation, Maintenance and Replacement Costs

A graphic portrayal of project features utilized in cost allocation studies is presented in exhibit 8-38. Allocation of costs is presented in table 8-47.

TABLE 8-46
SUMMARY OF COSTS ($1,000)
COST ALLOCATION STUDIES - DALTON RESERVOIR, GEORGIA

	Multiple-Purpose Projects						Alternative Single-Purpose Projects				Multiple-Purpose Project Without:				
	Special Costs														
Item	**F.C.**	**W.Q.-W.S.**	**Rec.**	**Reg.Exp.**	**Joint-use**	**Total**	**F.C.**	**W.Q.**	**W.S.**	**Rec.**	**F.C.**	**W.Q.**	**W.S.**	**Rec.**	**Reg.Exp.**
Construction First Cost															
Lands and damages			350		8,350	8,700	6,800				6,400			8,350	
Relocations					17,450	17,450	16,850				15,210			17,450	
Reservoir & pool preparation					1,280	1,280	200				1,280			1,120	
Dam and appurtenances					9,240	9,240	9,020				8,780			9,240	
Recreation facilities			2,150		-	2,150	-				2,150				
Buildings, grounds, and utilities					470	470	170				470			234	
Perm. operating equipment					160	160	160				160			160	
Wildlife mitigation and enhancement			4		46	50	-				50			46	
Total, initial			2,504		36,996	39,500	33,200				34,500	39,500	39,500	36,600	39,500
Future recreation facilities			4,800		-	4,800	-				4,800	4,800	4,800	-	4,800
TOTAL			7,304		36,996	44,300	33,200				39,300	44,300	44,300	36,600	44,300
Development Plan			-	2,332,400	-	2,332,400	-				2,332,400	2,332,400	2,332,400	2,332,400	-
TOTAL CONSTRUCTION COSTS			7,304	2,332,400	36,996	2,376,700	33,200				2,371,700	2,376,700	2,376,700	2,369,000	44,300
Investment Costs															
Initial construction costs			2,504	-	36,996	39,500	33,200				34,500	39,500	39,500	36,600	39,500
Interest during construction			163	-	2,405	2,568	2,158				2,243	2,568	2,568	2,379	2,568
Investment cost, initial increment			2,667	-	39,401	42,068	35,358				36,743	42,068	42,068	38,979	42,068
Future recreation facilities			4,800	-	-	4,800	-				4,800	4,800	4,800	-	4,800
Interest during construction			-	-	-	-	-				-	-	-	-	-
Investment cost, future increment			4,800	-	-	4,800	-				4,800	4,800	4,800	-	4,800
Investment cost, developmental plan			-	2,332,400	-	2,332,400	-				2,332,400	2,332,400	2,332,400	2,332,400	-
TOTAL INVESTMENT COSTS			7,467	2,332,400	39,401	2,379,268	35,358				2,373,943	2,379,268	2,379,268	2,381,379	46,868
Annual Financial Charges															
Initial Increment															
Interest & Amortization			90	70,868	1,335	72,293	1,198				72,113	72,293	72,293	72,189	1,425
Operation & Maintenance:															
Recreation & Mitigation (112+6)			112		6	118	-				118	118	118	6	118
Dam			-		90	90	90				90	90	90	90	90
Major Replacement:															
Recreation			22		-	22	-				22	22	22	-	22
Dam			-		6	6	6				6	6	6	6	6
Total, Initial Increment			234	70,868	1,437	72,529	1,294				72,349	72,529	72,529	72,291	1,661
Future Increment (discounted)															
Interest & Amortization			82		-	82	-				82	82	82	-	82
Operation & Maintenance			183		-	183	-				183	183	183	-	183
Major Replacement			20		-	20	-				20	20	20	-	20
Total, Future Increment			285		-	285	-				285	285	285	-	285
TOTAL ANNUAL FINANCIAL CHARGES			509	70,868	1,437	72,814	1,294	163	695	1,506	72,634	72,814	72,814	72,291	1,946

PROJECT FEATURES, COST ALLOCATION STUDIES

DALTON RESERVOIR, GEORGIA

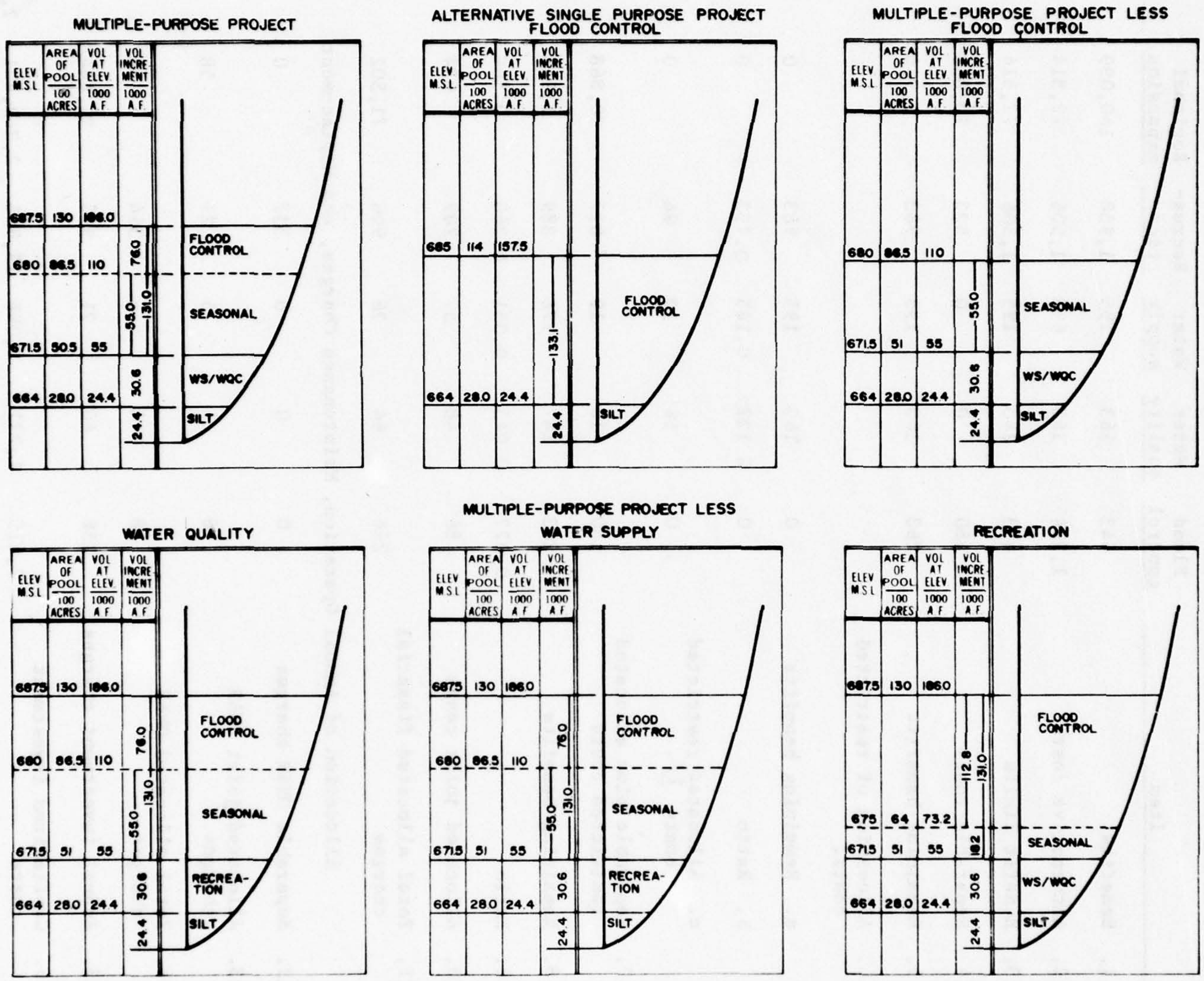


EXHIBIT 8-38

TABLE 8-47
ALLOCATION OF COSTS ($1,000)
SEPARABLE COSTS - REMAINING BENEFITS METHOD

Item	Flood control	Water quality	Water supply	Recreation	Regional expansion	Total
1. Benefits	443	163	195	1,958	160,099	
2. Alternative costs	1,294	163	695	1,506	72,814	
3. Benefit limits	443	163	195	1,506	72,814	75,121
4. Separable costs	180	0	0	523	70,868	71,571
5. Remaining benefits	263	163	195	983	1,946	3,550
6. Allocation of restricted costs:						
a. Remaining benefits	0	163	195	983	0	1,341
b. Ratio	0	0.122	0.145	0.733	0	1.000
c. Allocated restricted costs 1/	0	16	19	94	0	129
7. Separable plus allocated restricted costs	180	16	19	617	70,868	71,700
8. Remaining benefits	263	147	176	889	1,946	3,421
9. Ratio	0.077	0.043	0.051	0.260	0.569	1.000
10. Allocated joint costs	86	48	57	289	634	1,114
11. Total allocated financial charges	266	64	76	906	71,502	72,814
Allocation of Annual Operation, Maintenance Charges, and Replacement						
12. Separable OM&R charges	0	0	0	337	0	337
13. Allocated joint OM&R charges	8	4	5	27	58	102
14. Total allocated OM&R charges	8	4	5	364	58	439
15. Annual investment charges	258	60	71	542	71,444	72,375
16. Capitalized investment costs	7,615	1,771	2,096	15,998	2,349,401	2,376,881

1/ Restricted joint costs of adding storage for water quality, water supply and recreation.

TABLE 8-47
ALLOCATION OF COSTS ($1,000)
SEPARABLE COSTS - REMAINING BENEFITS METHOD (Continued)

Item	Flood control	Water quality	Water supply	Recreation	Regional expansion	Total
17. Adjustment for discount on future increment	0	0	0	2,387	0	2,387
18. Total allocated investment costs	7,615	1,771	2,096	18,385	2,349,401	2,379,268
19. Investment in specific use land & facilities	0	0	0	7,467	2,332,400	2,339,867
20. Interest during construction on line 19	0	0	0	163	0	163
21. Investment in joint-use lands & facilities	7,615	1,771	2,096	10,918	17,001	39,401
22. Allocated interest during construction on line 21	465	108	128	666	1,038	2,405
23. Allocated construction costs of joint-use land facilities	7,150	1,663	1,968	10,252	15,963	36,996
24. Construction costs of specific-use lands & facilities	0	0	0	7,304	2,332,400	2,339,704
25. Total allocated construction costs	7,150	1,663	1,968	17,556	2,348,363	2,376,700
26. Construction costs of future increment	0	0	0	4,800	0	4,800
27. Construction costs of development plan	0	0	0	0	2,332,400	2,332,400
28. Construction cost of initial element	7,150	1,663	1,968	12,756	15,963	39,500
29. Total construction costs	7,150	1,663	1,968	17,556	15,963	44,300

Annual charges - Multiple purpose project	$72,814
less cost of flood control project	72,162
Cost of adding WQC, WS, & Rec	652
less assigned separable costs (0+0+532)	523
restricted costs	129

SECTION VII - APPORTIONMENT OF COSTS

24. GOVERNING LEGISLATION

Apportionment of project costs between Federal and non-Federal interests was made according to the following criteria.

a. All costs allocated to flood control in the multiple-purpose project are apportioned to the Federal Government according to applicable flood control legislation. The effects of the project are widespread in the sense of flood reduction along the Conasauga, Oostanaula and Coosa Rivers and tributaries and more so in the economic impact of the project over the five-county economic study area.

b. All costs allocated for water quality control are apportioned to the Federal Government according to the Water Pollution Control Act of 1961 (PL 87-88). Widespread benefits accrue to the project because the economic impact of the project services in surrounding counties.

c. All costs allocated to water supply are apportioned to non-Federal interests according to the Water Supply Act of 1958 (PL 85-500).

d. The recreation development was determined to be appropriate for administration by a non-Federal agency. Therefore, the separable costs associated with the recreation development in the reservoir are divided between Federal and non-Federal interests on a 50-50 basis. Non-Federal interests are apportioned all operation with the Federal Water Projects Recreation Act (PL 89-72).

25. APPORTIONED COSTS

The apportioned costs are summarized in table 8-48.

TABLE 8-48
APPORTIONMENT OF COSTS BETWEEN FEDERAL AND NON-FEDERAL INTERESTS 1/

Item	Construction Costs ($1,000) Federal	Construction Costs ($1,000) Non-Federal	Construction Costs ($1,000) Total	Annual O&M & Major Replacements ($1,000) Federal	Annual O&M & Major Replacements ($1,000) Non-Federal	Annual O&M & Major Replacements ($1,000) Total
Flood Control	7,150	0	7,150	8	0	8
Water Quality	1,663	0	1,663	4	0	4
Water Supply	0	1,968	1,968	0	5	5
Recreation	13,706	3,850	17,556	27	337	364
Expansion	15,963	0	15,963	58	0	58
Total	38,482	5,818	44,300	97	342	439

1/ Does not include development plan costs.

Apportionment of costs of the recreation development is presented in table 8-49.

TABLE 8-49
APPORTIONMENT OF RECREATION CONSTRUCTION COSTS

	($1,000)
Cost of Multiple-Purpose Project	44,300
Cost of Multiple-Purpose Project less Recreation	36,600
Separable Cost of Recreation	7,700
Lands	350
Facilities	7,190
Reservoir and Pool preparation	160
Cost Sharing:	
Federal	3,850
Non-Federal	3,850

SUB-ALLOCATION APPORTIONED RECREATION CONSTRUCTION COSTS

Recreation	Benefits ($1,000)	Ratio	Apportioned Costs ($1,000)
General	1,762	900	6,930
F&W	196	100	770
Total	1,958	1,000	7,770

26. STATE AND LOCAL ASSURANCES

The requirements for local cooperation for the construction of Dalton Reservoir are that the State will pay one-half of the separable construction costs associated with the development for recreation and all separable costs for operation, maintenance and major replacement for that function. The city of Dalton has expressed the intent to reimburse the Federal government for the construction and operation and maintenance cost allocated to the water supply. These costs, as stipulated in the City's resolution, are those provided when the public hearing was held at Dalton. Based on information in the Summary Report, Part I, which gives the latest estimate of local cost, the City's costs would be less than indicated in the resolution providing assurance of cooperation. Copies of letters indicating the intent to cooperate in developing the water supply and recreation functions are included as exhibits 8-39, 8-40 and 8-41.

Executive Department
Atlanta

Lester Maddox
GOVERNOR

Zell Miller
EXECUTIVE SECRETARY

September 9, 1969

Colonel Robert E. Snetzer
District Engineer
U. S. Army Engineer District, Mobile
P. O. Box 2288
Mobile, Alabama 36601

Dear Colonel Snetzer:

Reference is made to your letter of March 21, 1968, relative to the proposed multiple-purpose reservoir on the Conasauga River near Dalton, Georgia, which is now being studied in connection with the Appalachian Water Resource Survey. Members of my staff discussed the proposed project May 2 with your representative Mr. William Reid.

I can assure you that the State of Georgia is vitally interested in the conservation and enhancement of its water as well as other natural resources. If the Dalton reservoir project is justified primarily for flood control, water supply and expansion benefits, it is the desire and intent of the State of Georgia to agree to participate in the development of project lands and facilities and administer the project land and water areas for recreation and fish and wildlife enhancement under the Federal Water Project Recreation Act of 1965; (Public Law 89-72).

The extent of financial participation would be subject to a master recreation plan for the reservoir created cooperatively by the Corps of Engineers, the State and its local governments. Fish and wildlife values should be mitigated in a plan agreeable to the State Fish and Game Commission.

Lands for public recreation should be reserved in accord with Sec. 3(b)(1) of Public Law 89-72; subject to future development of the recreation plan and execution of acceptable agreements for non-federal project operation.

Colonel Robert E. Snetzer
Page Two
September 9, 1969

The State of Georgia can be committed to the expenditure of funds only through action of the State Legislature. An agreement to that effect, therefore, would be a matter for consideration by the Legislature prior to construction of the recreation project when details of the plans are finalized.

Sincerely,

Lester Maddox
Governor

LM:kw

R E S O L U T I O N

WHEREAS, The U. S. Army Corps of Engineers is considering the construction of a reservoir on the Conasauga River near The City of Dalton and;

WHEREAS, The City of Dalton is the tufted textile center of the world and;

WHEREAS, The tufted textile industry is a major water-using industry and;

WHEREAS, The future growth and expansion of the tufted textile industry in and near The City of Dalton is vital to the City's continued economic advancement and;

WHEREAS, The continued economic advancement of The City of Dalton is dependent upon the availability of an adequate supply of water to meet the expanding industrial, residential, and commercial demand for water consumption and to assist in effectively maintaining and controlling adequate quality of said City's expanding discharge of water into the Conasauga River and;

WHEREAS, Water-oriented recreation facilities and activities are desired and needed by The City of Dalton and it's citizens and;

WHEREAS, The proposed reservoir will assist the City in satisfying it's future water supply, water quality and recreation needs;

NOW THEREFORE, BE IT RESOLVED, That the Mayor and Council of The City of Dalton fully endorse the construction of said reservoir by the U. S. Army Corps of Engineers.

BE IT FURTHER RESOLVED, That it is the desire and intent of the City at this time to participate in the development of the water supply features of the Dalton project and bear all construction costs allocated to that purpose currently estimated at $2,245,000 and the annual cost of operation, maintenance and major replacements allocated thereto estimated at $6,000, as stipulated by the Water Supply Act of 1958, as amended.

Unanimously adopted this the 1st day of July, 1968.

/s/ Carlton C. McCamy
Mayor

ATTEST:

/s/ Andrew J. Lowery
City Clerk

State Water Quality Control Board
47 Trinity Avenue, S. W.
Atlanta, Georgia 30334

October 21, 1968

Mr. William H. Reid
Civil Engineer
Mobile District, Corps of Engineers
P. O. Box 2288
2301 Airport Boulevard
Mobile, Alabama 36601

RE: Proposed Dam & Reservoir
Dalton, Georgia

Dear Mr. Reid:

Following our telephone conversation of October 21, 1968, I will make the following comments regarding the Town of Chatsworth, Georgia, and its relation to the referenced project:

1. The Town of Chatsworth has a 0.75 MGD extended aeration plant with aerobic digestion, sludge drying beds, and disinfection of the effluent for domestic and industrial waste under construction. It is anticipated the treatment plant will be placed in operation during 1969.

2. Since the Georgia Water Quality Control Board requires a minimum of secondary biological treatment with disinfection, we do not anticipate any significant pollution problem from the Chatsworth Area on the proposed reservoir. If degradation of downstream waters should ever occur, the Board has the authority and responsibility to require the necessary degree of treatment to maintain sufficient quality to protect downstream uses.

3. The beneficial uses designated for the reservoir will be included when the Board develops stream classifications for the intra-state waters in Georgia.

We recognize any upstream developments produce residual pollution; however, based on the degree of treatment required and the small population (approx. 2,000) of Chatsworth, we do not anticipate any significant water quality problems. If you have additional questions, please advise.

Sincerely,

J. Leonard Ledbetter

J. Leonard Ledbetter, Director
Water Quality Surveys Service

Exhibit 8-41

SECTION VIII - COORDINATION IN PLANNING

27. FEDERAL AGENCIES

During planning, studies were coordinated with the Federal Departments of Agriculture; Commerce, Interior, and Health, Education and Welfare; the Federal Power Commission, and the Appalachian Regional Commission, either directly by the Mobile District of the Corps of Engineers, or through the Water Development Coordinating Committee for Appalachia (WDCCA), as appropriate.

Many Federal agencies such as the U.S. Geological Survey, Environmental Science Services Administration, and the Office of Business Economics provided basic data for project planning, such as climatologic, streamflow, and economic records through regular publications or special reports. Other Federal agencies participated indirectly by assisting the state and local agencies and planning groups.

Several agencies made special studies as an aid in formulation and evaluation of the plan of development for Dalton Reservoir. Reports of these agencies are included in the appropriate appendixes to this report. The following paragraphs present recommendations or views of participating agencies, and actions taken.

Bureau of Outdoor Recreation

BOR surveyed the recreation market and determined the demand for recreational opportunities, current and intermediate future, could be met by expansion of existing areas in the sub-region at the level of development shown in the outdoor recreation evaluation summary in Appendix F. They estimate the project can contribute to meeting needs after 1975 and at ultimate development 2,180,000 recreation days annually could be expected.

BOR recommend about 2,000 acres be purchased for general recreation which is included in the plan.

Two important historical sites are located near the project area. The Chief Vann House will be on the edge of the reservoir near Spring Place and New Echota which is south of the dam. NPS recommends that when the project is authorized additional survey and a program of salvage of both archeological and historical information will be necessary.

U.S. Fish and Wildlife Service

The Fish and Wildlife Service evaluated the fish and wildlife conservation and enhancement aspects of the Dalton Reservoir and their report is included in Appendix G to this report.

As recommended by the Fish and Wildlife Service the following provisions have been incorporated into the plan of development: Fisherman access and parking facilities would be provided to accommodate

725 cars and 365 boat trailers. The Service's recommendation that at least 6 one-acre parking areas be provided at accessible points downstream from the reservoir were increased to two acres each in order to minimize interference with normal cross river traffic from users of these access sites. Barriers will be constructed across Holley and Mill Creeks (Murray County) and the headwaters of the Conasauga to prevent contamination from rough fish into the good trout producing streams. Sidewalks or catwalks for reservoir bridges are included with the recommendation of parking areas at the end of the bridge or causeway. Reservoir clearing will be coordinated in subsequent planning stages with representatives of the Fish and Wildlife Service and the Georgia State Game and Fish Commission. A zoning plan to prevent conflicts between reservoir uses in a normal practice and will be developed cooperatively between the Service, the Georgia State Game and Fish Commission and the Corps of Engineers in later studies. To offset the loss of hunting opportunities which will result from inundating the lands in the reservoir area it is proposed to acquire another 4,200 acres suitable for upland game and waterfowl habitat. Approximately 2,500 acres of project land in the upper reach of the Conasauga River and about 900 acres in the upper reach of Mill Creek (Murray County) will be made available to the Georgia Game and Fish Commission in accordance with a General Plan for Fish and Wildlife Management as provided for in the Fish and Wildlife Coordination Act.

Federal Water Pollution Control Administration

The FWPCA has evaluated the present and future water requirements for municipal and industrial water supply and water quality control. The report, included in Appendix D, presents needs data for the year 2020 based on "benchmark" projections provided by the Corps of Engineers.

U.S. Bureau of Mines

The Bureau of Mines reconnaissance survey determined that the reservoir would not involve inundation of significant mineral deposits.

National Park Service

The NPS inventoried the historical and archeological sites in the project area and the results thereof are summarized in the BOR report in Appendix F of this report, as discussed in paragraph 13. The NPS will be responsible for the further survey and salvage work at such sites, as determined necessary during pre-construction planning, in cooperation with appropriate non-Federal entities who have responsibilities in this research field.

The objectives of the National Park Service are:

(a) Preservation and enhancement of areas of unique scenic, archeological, historic, and natural science values.

(b) Improvement of land and water quality management.

(c) Consideration of structural and non-structural measures, beneficial flow regulation, and flow regulation storage.

In addition to the above, Public Law 89-665, the National Historic Preservation Act of 1966 requires that any Federal or Federally-assisted undertaking in any state take into account its effect on any historic site or structure listed in the National Register of Historic Places. The National Register of Historic Places is a list of properties significant to the nation, to the states, and to local areas because of significance in history, architecture, archeology, and culture.

Studies by the National Park Service to carry out these objectives will be requested by, and coordinated with the appropriate office having responsibility for construction of this project. These studies will be requested when advanced engineering and design for the project is iniated.

28. STATE AGENCIES

Coordination has been maintained throughout the course of these studies with the Georgia State Game and Fish Commission, State Water Quality Control Board, and complementary agencies involved in conservation, fish, wildlife, recreation, etc.

29. PUBLIC HEARINGS

Public hearings were held by the District Engineer, U.S. Army Engineer District, Mobile, on 6 June 1968 at Dalton, Georgia, for the purpose of determining the views and desires of local interests on development of the Dalton Reservoir for water supply and allied purposes. Approximately 162 people attended the hearing. The hearing included representatives of Federal, State, and local governing bodies, representatives of firms and industries and interested proposals were submitted. Expressions of major concern for the development of adequate water supply were made. Copies of the transcripts of public hearings are available in the Mobile District Office, Corps of Engineers.

A list of local organizations submitting statements or resolutions favoring the project follows:

Conasauga River Development Assn.
City of Dalton
U.S. Department of Agriculture, Soil Conservation Service
Georgia Water Quality Control Board
Commissioners of Roads and Revenues, Whitfield County
Dalton-Whitfield County Planning Commission
Chatsworth-Murray County Planning Commission
Coosa Valley Area Planning and Development Commission
Citizen's Advisory Committee, Dalton
Dalton-Whitfield Chamber of Commerce
Georgia Kraft Company
Dalton Jaycees
Dalton Rotary Club
Kiwanis Club
Tufted Textile Manufacturers Assn.
Murray County Junior Chamber of Commerce
Rome Area Chamber of Commerce
Dalton Recreation Department
First National Bank of Dalton
Tennessee Valley Canoe Club
Gordon County Chamber of Commerce

SECTION IX - DISCUSSION AND CONCLUSIONS

30. DISCUSSION

Formulation of the plan for development of the water resources of the Conasauga River Basin by construction of a multipurpose dam and reservoir project at the Dalton site, as presented herein, involved determination of the needs for the project and the most feasible solution of these identified needs. It was found that there are, or will be, needs for water control for the purposes of flood control, water supply, water quality, recreation, and economic expansion. The analyses involved in the project formulation clearly indicated that the proposed Dalton Reservoir project would provide an effective solution to many needs.

The Dalton Reservoir project would consist of the dam and its appurtentant structures; the reservoir and its contiguous areas for access and recreation development. The Dalton area is a center of economic expansion which needs removal of constraints on future growth and additional impetus for further development. The reservoir will become a part of a system for controlling flooding and stream water quality at downstream points in the Oostanaula River Basin. The water control capability of this project will be enhanced by the upstream watershed projects of the U.S. Department of Agriculture on tributaries such as Mill Creek Area, Coahulla Creek, and John's Creek, and the land treatment programs in the area above the project. The area benefitted by the project would extend beyond the boundaries of the Appalachian Region.

Since the Appalachian Survey has seen an extended period for report preparation (about 2 years) a check was made during its review in June 1969 to determine whether the estimated needs for 1980 for water supply and water quality control storage could materialize prior to 1980. The present supply for Dalton's municipal and industrial water is provided by a storage on Mill Creek Watershed in Whitfield County (15 mgd or 23 cfs, dependable) and the Conasauga River (25 mgd or 39 cfs, system capacity) at mile 36.1 with contributing drainage area of 306 square miles. The greatest demand (34 mgd or 53 cfs, June 1969) on the system occurs during a 3- to 5-month summer period when streamflow is at a minimum. In the summary of flow data and water uses given below it can be seen that the existing water supply needs of Dalton can be met by present sources without storage reserve except for extreme droughts. However, this assumes that the total flow of the river at the pumping station would be used and riparian obligations would be ignored.

Summary of Low Flow Data for Conasauga River
Related to Present Water Uses

Drought Frequency in Years	1	10	50	100
	Values in cfs			
Average Daily Flow:				
1 day	71	46	39	36
7 days	75	49	41	38
30 days	90	55	46	43
90 days	137	60	49	46
Municipal and Industrial Water Use 1/	39	39	39	39
Average Daily Flow in Excess of Use:				
1 day	32	7	0	-3
7 days	36	10	2	-1
30 days	51	16	7	4
90 days	98	21	10	7
Average Daily Flow Adjusted for Uncontrolled Drainage Area:				
1 day	42	12	3	2
7 days	54	18	8	5
30 days	70	28	16	12
Waste Loading	45	45	45	45
Dilution Ratio	Ratios			
1 day	0.9	0.3	0.1	0.1
7 days	1.2	0.4	0.2	0.1
30 days	1.6	0.6	0.4	0.3

1/ Water supply system capacity on the Conasauga River. Does not include 23 cfs obtained from Mill Creek.

Available dilution flows and waste loading (presently untreated or only partially treated) on the river at the mouth of Drowning Bear Creek are also shown in the above summary. In Section III of this report under the heading Water Quality Control, it is indicated that a dilution ratio of 3.5 is required to maintain acceptable stream quality after treatment of waste at the source, but the present dilution ratio for the annual 7-day low flow period is much less than the required and the reccurence of the 7 day-10 year low flow would result in a very serious pollution problem. This degree of pollution should not be tolerated since the water supply of downstream users, Calhoun and possibly Rome, may be contaminated. Additionally, this condition results in a stream unsuitable for fishing and other recreation uses.

31. CONCLUSION

The water services provided by the Dalton Reservoir project are presently needed to sustain and enhance the economic growth of this area of Water Sub-region E and adjacent areas.

To bring this plan of development to fruition the cooperative efforts of the U.S. Army Corps of Engineers and the State of Georgia will be required. Supportive plans and actions by other Federal and non-Federal agencies will also be needed. Vigorous support by local development groups and by private enterprise is especially needed to assure realization of the developmental potential. There is every indication at this time that the requirements of local cooperation will be fulfilled and the viable organizational base for industrial and urban development will continue.

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REPORT FOR DEVELOPMENT

OF

WATER RESOURCES IN APPALACHIA

PART III - PROJECT ANALYSES

CHAPTER 9

COOSA RIVER NAVIGATION PROJECT

Office of Appalachian Studies

Corps of Engineers

October 1969

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PART III

PROJECT ANALYSES

CHAPTER 9 - COOSA RIVER NAVIGATION PROJECT

TABLE OF CONTENTS

CHAPTER 9 - COOSA RIVER NAVIGATION PROJECT

TABLE OF CONTENTS (cont'd)

CHAPTER 9 - COOSA RIVER NAVIGATION PROJECT

LIST OF TABLES

LIST OF TABLES (cont'd)

LIST OF TABLES (cont'd)

CHAPTER 9 - COOSA RIVER NAVIGATION PROJECT

LIST OF EXHIBITS

PART III

PROJECT ANALYSES

CHAPTER 9 - COOSA RIVER NAVIGATION PROJECT

SECTION I - SUMMARY

1. PURPOSE AND SCOPE OF STUDY

Widespread interest in the development of the water resources of the Alabama-Coosa River basin dates back over a period of many years. In view of the demand for action just prior to World War II, the Chief of Engineers submitted a brief interim report on October 15, 1941 published as House Document No. 414, Seventy-seventh Congress, which recommended authorization of a general plan of basin development, including projects for the initial phase of development for navigation on the Alabama-Coosa River, " - - - in accordance with plans being prepared by the Chief of Engineers - - -." The recommendations of the report were authorized by Congress in the River and Harbor Act of March 2, 1945 and $60 million was authorized to be appropriated for initial and partial accomplishment of the plan. Advance planning was subsequently initiated on the authorized projects on the main stem of the Alabama-Coosa River.

In the early 1950's, the Alabama Power Company submitted proposals for additional dams and for modification of their existing structures (Jordan, Mitchell and Lay Dams) to develop the remaining head on the Coosa River for hydroelectric power. (See exhibit 9-1.) The new dams were to be planned to accommodate future locks to be built by the Federal government under the 1945 authorization. Congress approved the Company's plans by adoption of Public Law 436, Eighty-third Congress, passed June 28, 1954. This Act stopped planning studies of the Coosa River then in progress by the Corps of Engineers since it suspended authorization of the comprehensive basin plan, insofar as it provided for hydroelectric power development on the Coosa River, to permit the Alabama Power Company to develop the power under the Federal Power Act. The construction program on the Coosa by the Alabama Power Company under that law was initiated in 1958 and completed in 1968.

Interest in the development of the navigation aspects of the Alabama-Coosa River increased as the Alabama Power Company's program on the Coosa progressed. As a result, an interim report for navigation on the two streams was submitted to Congress on January 27, 1960 which was published as House Document No. 320, Eighty-sixth Congress. That report recommended that construction of the waterway on the Alabama

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DEVELOPMENT OF WATER RESOURCES IN APPALACHIA. MAIN REPORT. PART--ETC(U)

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River for navigation to Montgomery be initiated as soon as practicable; that the schedule for construction of locks at non-Federal, privately-owned dams on the Coosa River for navigation from Montgomery, to Gadsden, Alabama, be determined after the waterway to Montgomery is assured; and, that the extension of the waterway on the Coosa from Gadsden to Rome, Georgia, be deferred for restudy after completion of the waterway to Gadsden. Advance planning for the Alabama River projects was completed and construction of the improvements on that stream was initiated in 1963. These projects, consisting of channel improvement in the lower river and the Claiborne, Millers Ferry and Jones Bluff Locks and Dams (the latter two with hydroelectric power facilities), are planned for completion for navigation to Montgomery in 1971.

In its comments on House Document No. 320, the Bureau of the Budget stated that it would expect a current reevaluation of the Coosa River navigation project with any request for funds to initiate construction of the improvement. This study, the results of which are presented in this chapter of the report, is in response to the Bureau of the Budget's comments. Studies and investigations that were made included a traffic survey and a supplemental canvass of potential shippers to determine the prospective movement of commodities over the Coosa River waterway; an analysis of potential commerce, including water and alternative transportation costs, for derivation of the transportation savings, or user benefits, that would be afforded by the waterway; and, an analysis to determine the economic impact of the project, or developmental benefits attributable to the improvement. Since no major physical changes have occurred since the latest previous study was made to warrant additional engineering studies, previously developed plans were reviewed and revised and cost estimates were prepared which reflect current conditions, design criteria and price levels for similar work in the same general area.

2. PHYSICAL DESCRIPTION

The Coosa River drains a 10,200-square-mile area in northwest Georgia and northeastern Alabama, including a small area in the southeasternmost part of Tennessee. From its source at the junction of the Oostanaula and Etowah Rivers at Rome, Georgia, the Coosa flows 110 miles westerly into Alabama and then southerly 176 miles passing Gadsden, Childersburg and Wetumpka to join the Tallapoosa River and form the Alabama River about 18 miles north of Montgomery. The Alabama River flows westerly past Montgomery to Selma and then southerly a total distance of 310 miles to its juncture with the Tombigbee River forming the Mobile River about 45 miles north of Mobile, Alabama, the State's only deep water seaport. The Coosa River basin and the connecting Alabama River Waterway are shown on exhibit 9-1

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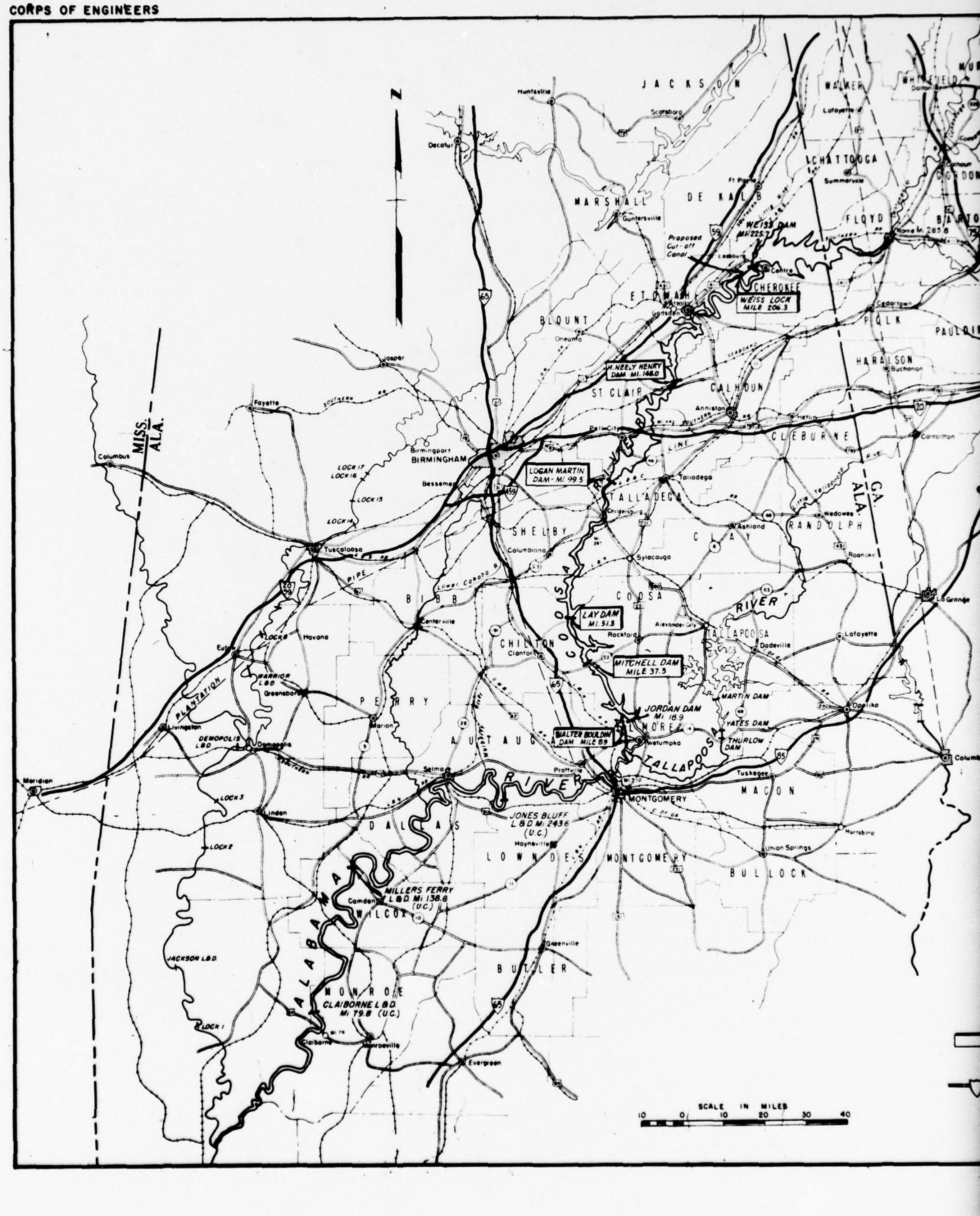

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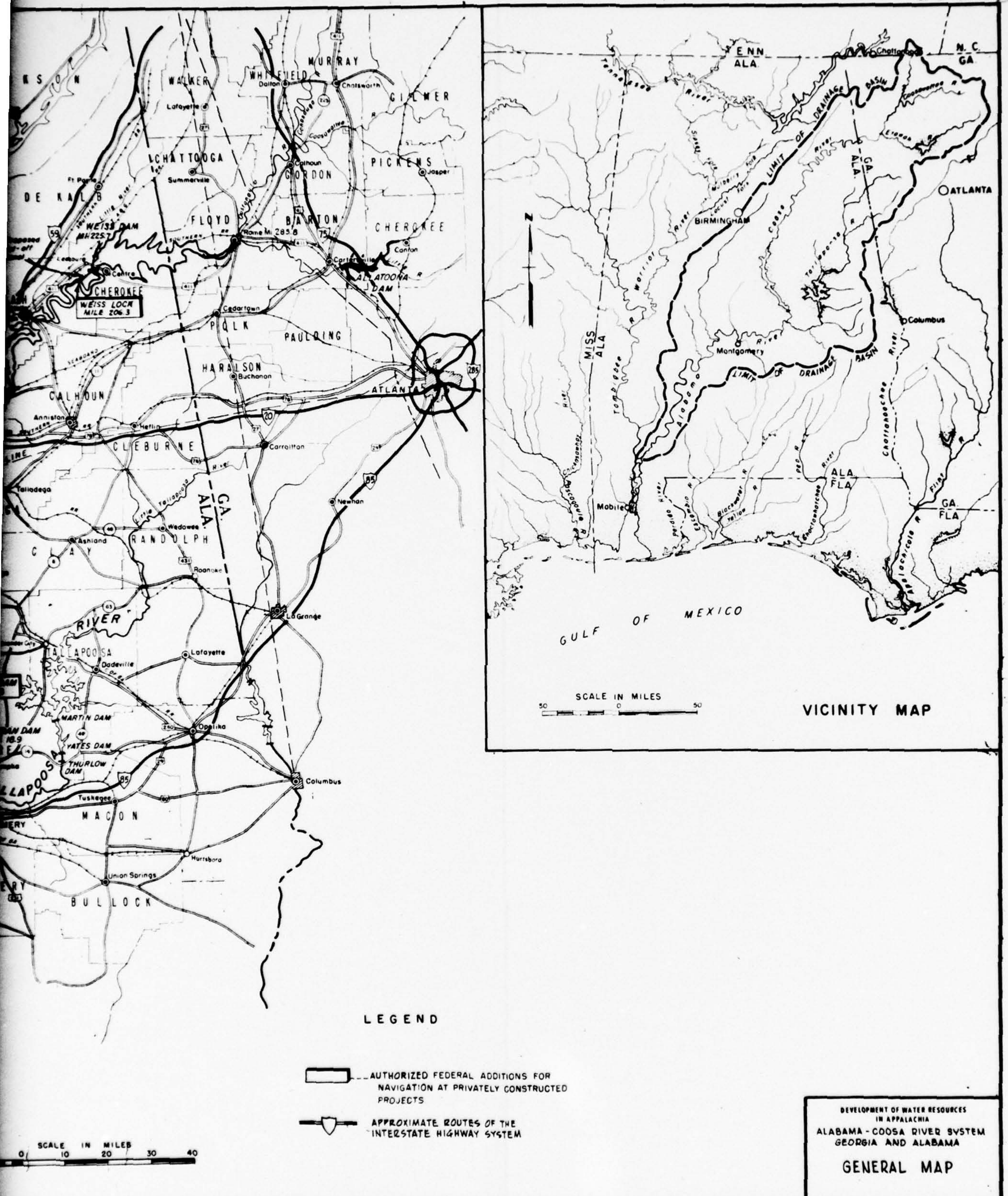

EXHIBIT 9-1

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Public Law 436 which authorized the construction of dams on the Coosa River by private interests directed that the series of dams, together with the existing hydroelectric power dams on the Coosa River, shall be best adapted to the comprehensive plan for development of the Coosa River for use or benefit of interstate commerce, for improvement and utilization of water power development and for other beneficial uses including recreational purposes. Also that the dams constructed by the licensee shall provide a substantially continuous series of pools and shall include basic provisions for the future economical construction of navigation facilities. Therefore, the license granted by the Federal Power Commission in September 1957 directed the Alabama Power Company to develop and coordinate plans with the Corps of Engineers, Mobile District. These plans especially as they relate to flood control and the provision of future navigation locks were reviewed and approved by the Corps of Engineers. The original plan submitted by the Alabama Power Company and used in HD 320 was to construct 4 new dams and raise 1 existing dam. However, after detailed study, a plan was developed to eliminate the lowermost dam on the Coosa River near Wetumpka, Alabama, and construct a powerhouse on the right bank of the existing Jordan project by providing an excavated canal for power release. The plan would eliminate the low lift lock at the Wetumpka project and place it in an excavated canal at the new Jordan project (Walter Bouldin Dam). This plan was advantageous to power production and to navigation since it would eliminate one lockage and also effect a savings in construction costs of the navigation project. The revised plan was approved by the Corps of Engineers.

All of the 439 feet of fall, or head, on the Coosa River has been developed by seven dams constructed by the Alabama Power Company; six in the river channel and one in an excavated canal leading from the reservoir formed by Jordan Dam to the Coosa River just below Wetumpka, Alabama. As shown on exhibit 9-2, these dams form essentially a continuous series of pools.

The principal feature of the Coosa River navigation project consists of single-lift locks that would be constructed at the existing Alabama Power Company's Walter Bouldin, Mitchell, Lay, Logan Martin, H. Neely Henry and Weiss Dams (see exhibit 9-1). The navigation channel nine feet deep and 150 feet wide, from the head of navigation in the Jones Bluff reservoir through an excavated canal to the Coosa River impoundments and thence to Rome, would be 280 miles long. Each of the locks would have a clear length of 600 feet and width of 84 feet, the same as the locks under construction on the Alabama River. The six locks, the highest being at the Walter Bouldin Dam with a lift of 127 feet, would provide a total maximum lift of 439 feet. A navigation

profile of the Coosa River is shown on exhibit 9-2. Details of the proposed lock at Mitchell Dam, which is typical of the remaining five locks included in the project, are shown on exhibit 9-3.

Other work required for the project includes the removal of the obsolete Mayo's Bar Lock and Dam located on the Coosa River about seven miles downstream from Rome. Since this structure forms a pool extending a short distance up the Oostanaula River, from which the City of Rome obtains its water supply, a low sill or weir would have to be constructed in that stream just below the water intake to maintain an adequate depth in the river for pumping. Dredging in the upper reaches of the existing reservoirs on the Coosa River would be required to provide a nine-foot channel depth for navigation. Excavation of a spur channel from the waterway in Black Creek at Gadsden to the Republic Steel Corporation plant, a major potential waterway user, would also be necessary. Six railroad and 12 highway bridges would require modification or reconstruction to provide the required navigation clearances of 150 feet horizontal and 42.5 feet vertical above ordinary high water. Table 9-1 lists the bridges crossing the Coosa River along the navigation route, giving the owner, location, type and present vertical and horizontal clearances. The table does not include 3 bridges over the Black Creek Channel at Gadsden, since modification of these structures will be entirely the responsibility of local interests.

Relocation costs, including road and bridge modifications, power and communication lines, pipelines, and miscellaneous discharge and protective works, are shown in tables 9-12 and 9-14 of Section II. The total costs (January 1969 prices), including contingencies are $34,368,000 for the waterway from Montgomery to Gadsden and $6,125,000 for the Gadsden-Rome reach. These figures compare with $3,932,000 and $558,000, respectively, as computed for the 1959 report (H.D. No. 320). The cost changes are due mainly to increases in the construction cost index; the increase in required vertical clearance of bridges from 35 feet to 42.5 feet; to changes in bridge-construction standards of the Bureau of Public Roads, which now require a minimum width of bridge floor equal to pavement width plus width of usable shoulders; and to additional structures not included in the 1959 report, including Interstate Highway 20 and numerous sanitary and public utility structures.

3. PROJECT IMPACTS

The project would provide an economical method of transporting bulk commodities to and from a 34-county area in Georgia and Alabama considered to be tributary to the Coosa River. This area, which is discussed in more detail later in this chapter, includes the Dalton-Calhoun and Rome growth centers in Georgia and the Gadsden and Anniston growth centers in Alabama. Also located in the area are smaller growth

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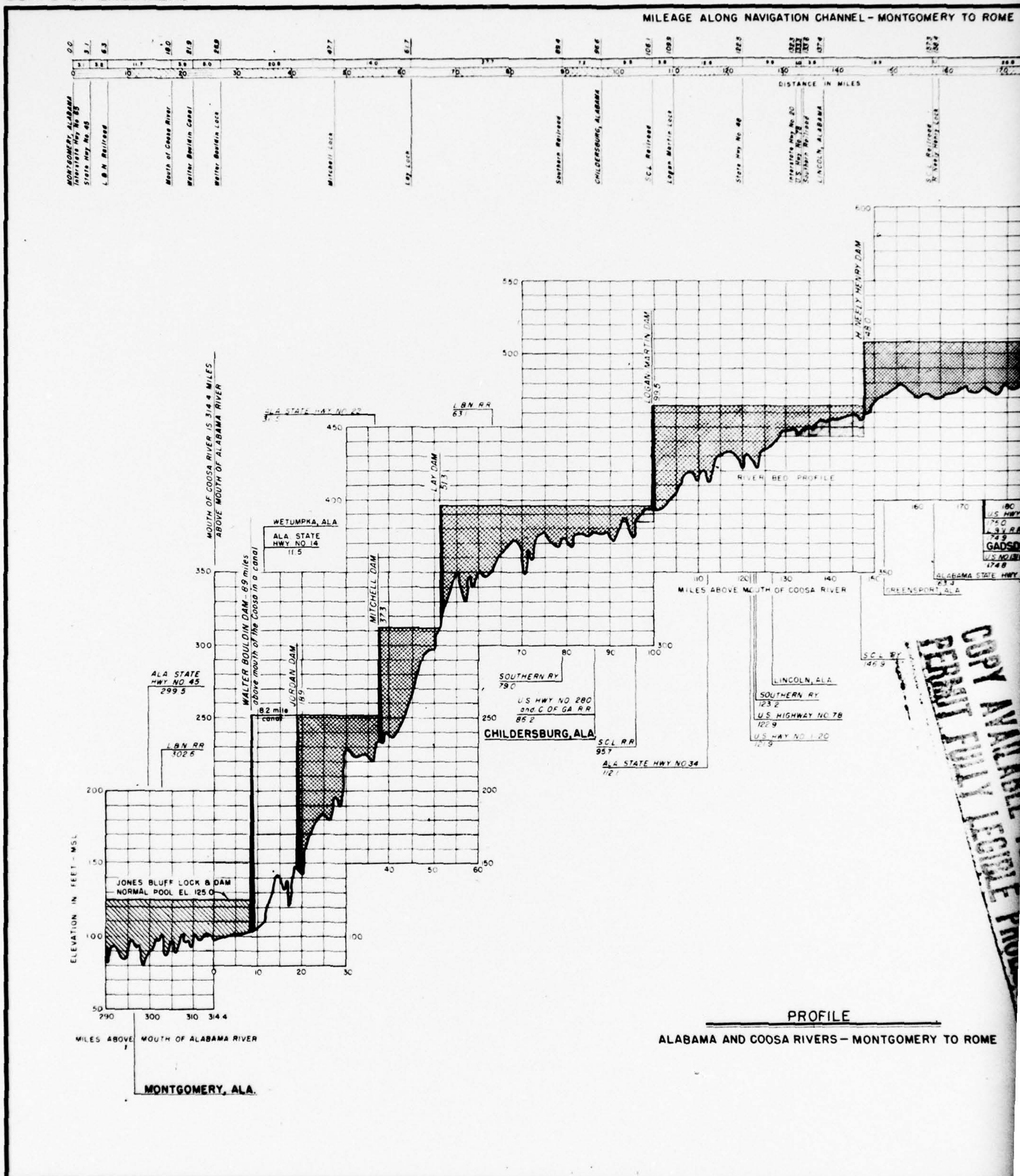
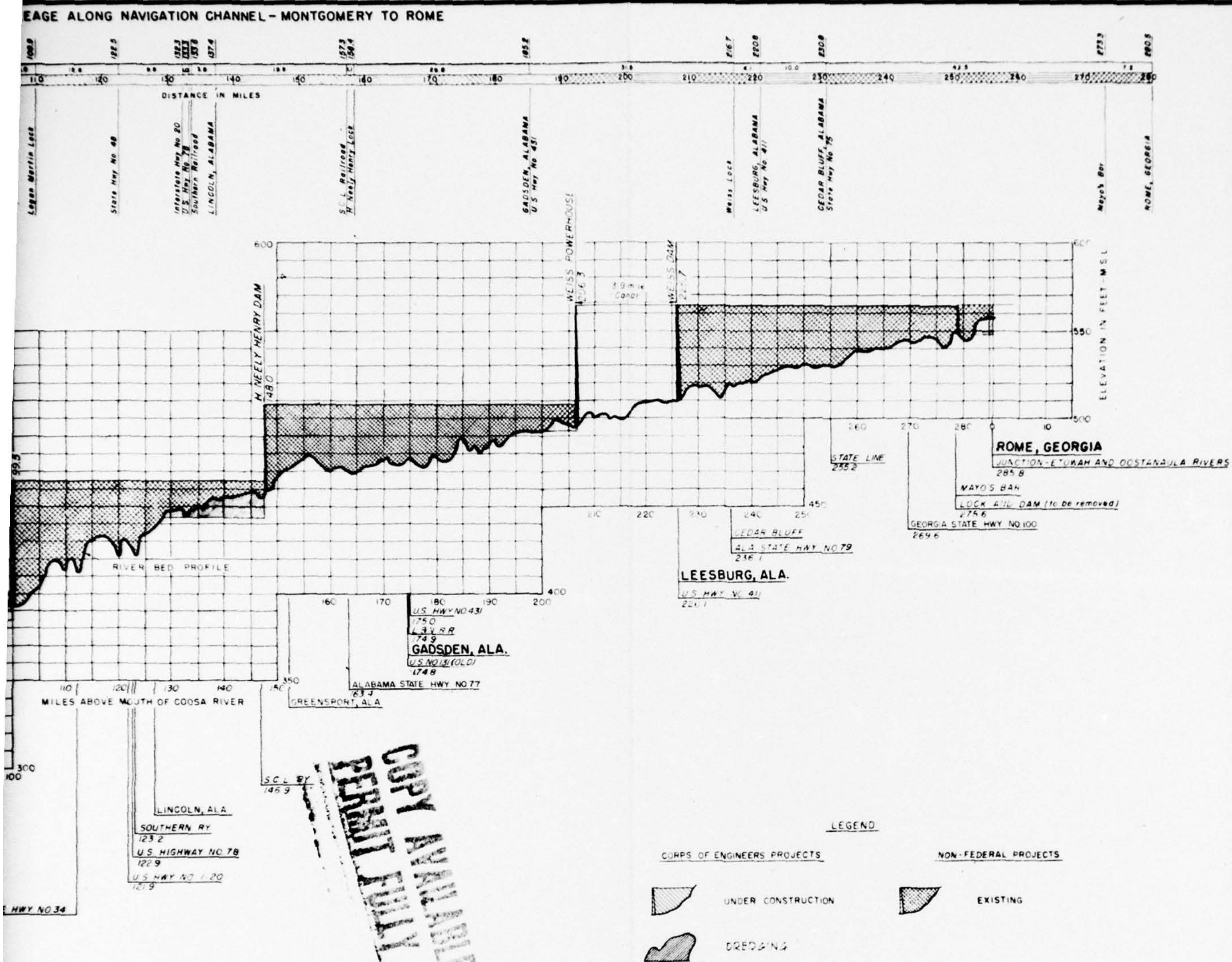


PROFILE

ALABAMA AND COOSA RIVERS – MONTGOMERY TO ROME

U. S. ARMY



PROFILE

ALABAMA AND COOSA RIVERS – MONTGOMERY TO ROME

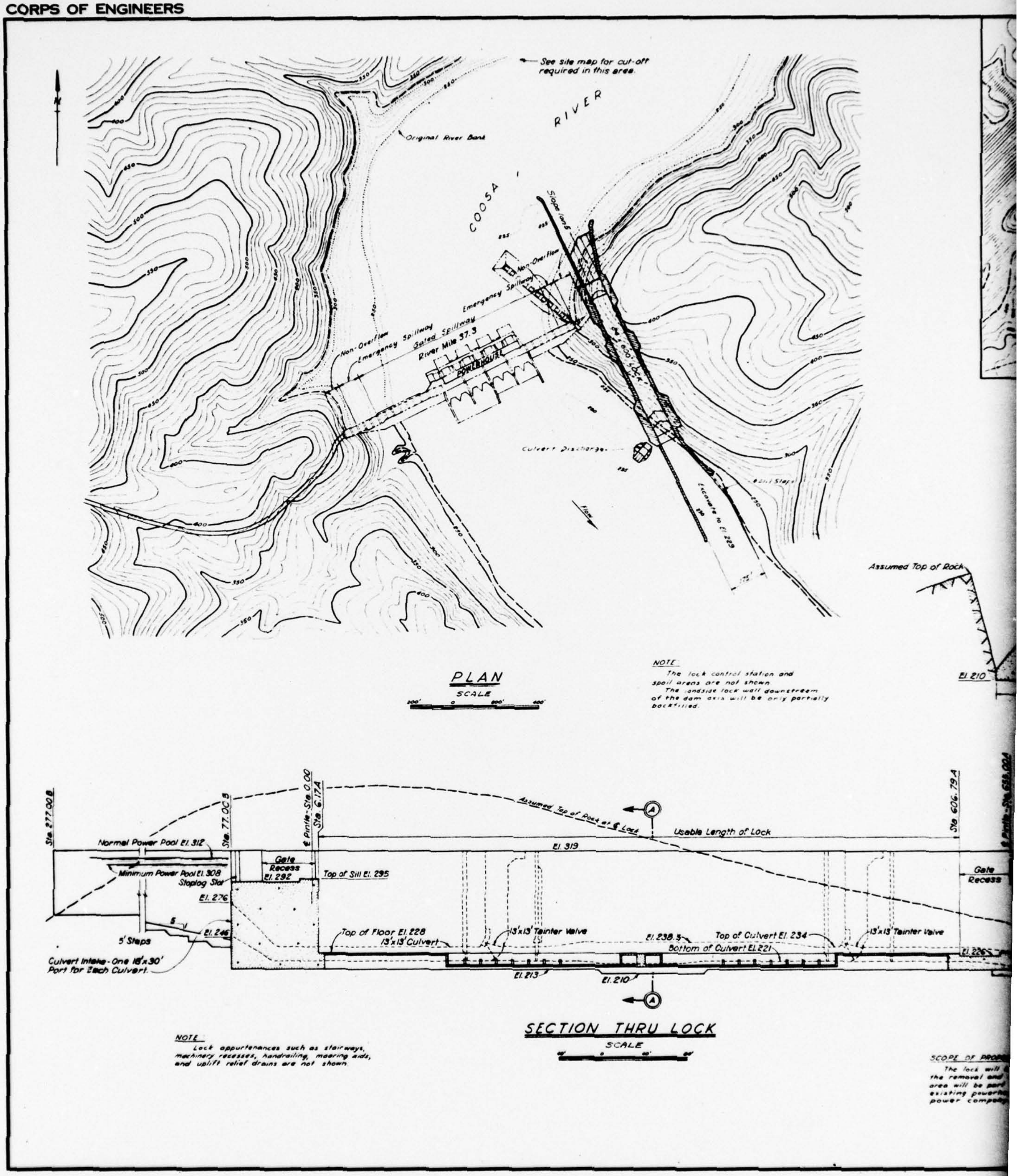
U. S. ARMY ENGINEER DISTRICT, MOBILE
CORPS OF ENGINEERS
MOBILE, ALA.

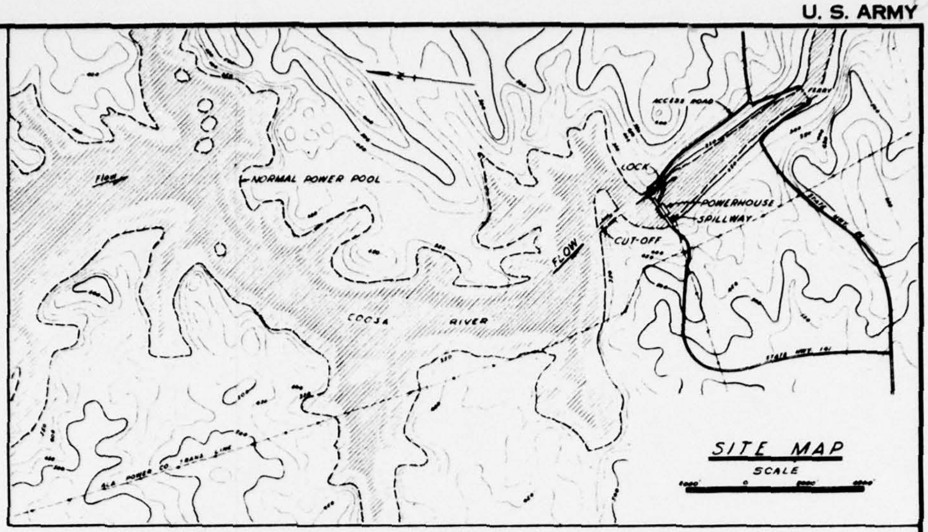
DEVELOPMENT OF WATER RESOURCES IN APPALACHIA

PROFILE
ALABAMA & COOSA RIVERS

SER. REF. NO.	SPEC. NO.	SIZE	FILE NO.
	SCALE	DATE	DRAWING NO. / SHEET

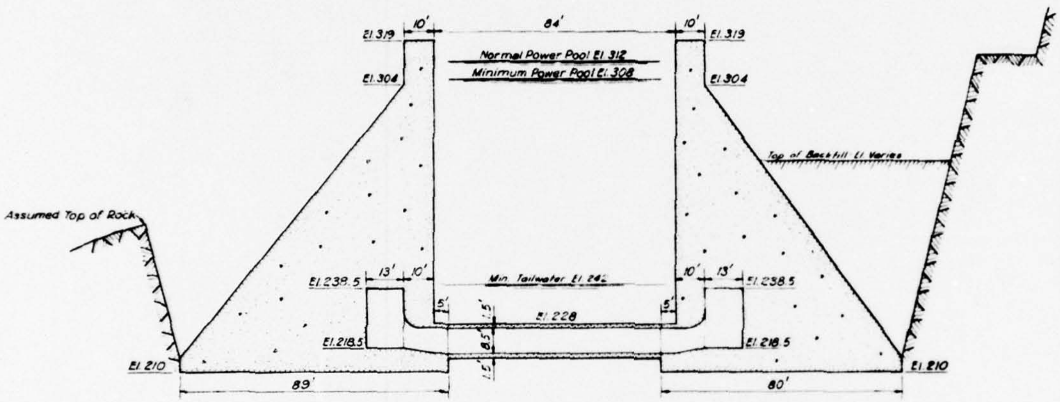
CORPS OF ENGINEERS





SITE MAP

SCALE



SECTION A-A

SCALE

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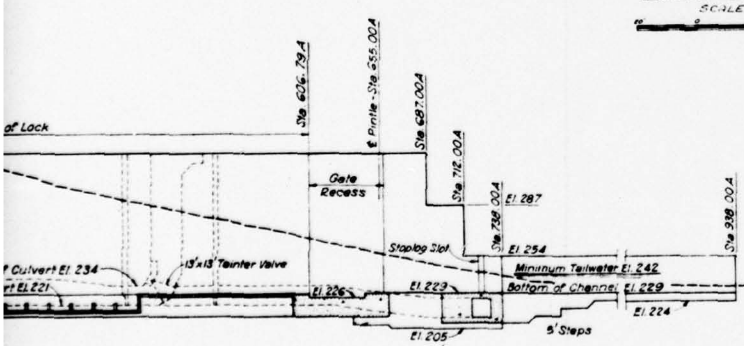

GENERAL NOTES

All elevations are referred to Mean Sea Level.
This drawing was prepared using topographic and geologic data obtained from the Alabama Power Company.

SCOPE OF PROPOSED CONSTRUCTION

The lock will be constructed by the U.S. Government and the removal and replacement of any structures in the lock area will be part of the lock contract. No changes to the existing powerhouse and spillway are proposed by the power company.

SYMBOL	DATE	DESCRIPTION	BY	BY	BY
	June 58	Lock Size Changed to 84' x 600'			

CORPS OF ENGINEERS, U. S. ARMY
OFFICE OF THE DISTRICT ENGINEER
MOBILE, ALA.

DEVELOPMENT OF WATER RESOURCES IN APPALACHIA
ALABAMA-COOSA RIVER SYSTEM
GEORGIA AND ALABAMA
MITCHELL LOCK

DRAWN: C.H.H. TRACED
CHIEF, CONC. SECTION
CHIEF, STRUCT. SECT.
APPROVED: CHIEF, DESIGN BRANCH
APPROVED: CHIEF, ENGINEERING DIVISION DATE: SEPT 1957
APPROVED: FOR THE D.E. LT COLONEL, CORPS OF ENGINEERS, ASST DISTRICT ENGINEER
DATE: SEPT 1957
SCALE: AS SHOWN
SPEC. NO.
FILE NO. A-9-1-163
DRAWING NO. 3
SHEET 3 OF 7

EXHIBIT 9-3

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TABLE 9-1

BRIDGES CROSSING THE COOSA RIVER NAVIGATION ROUTE

Bridge	Location Miles above mouth of Coosa (1)	Type	Present clearance-ft. Vert. at OHW	Present clearance-ft. Horiz.
Southern Ry.	79.0	Fixed	7.8	170
Central of Georgia R.R.	86.3	Fixed	15.4	200
U. S. Nos. 231 and 280	86.2	Fixed	13.3	180
Seaboard Coast Line R.R.	95.7	Fixed	25.3	140
Talladega County (Ala.) No. 70	96.0	Fixed	(2)	(2)
Alabama No. 34	112.1	Fixed	31.8	150
Interstate 20	121.9	Fixed	29.6	250
U. S. No. 78	122.9	Swing	15.3	100
Southern Ry.	123.2	Swing	8.0	102
Seaboard Coast Line R.R.	146.9	Swing	12.4	83
Alabama No.77	163.4	Swing	-	100
U. S. No. 431 (old)	174.8	Fixed	27.0	100
U. S. No. 431	175.0	Fixed	44.0	146
Louisville & Nashville R. R.	174.9	Swing	17.5	107
Etowah County (Ala.) No. 30	189.0	Swing	36.5	150
U. S. No. 411	226.1	Swing	34.0	162
Alabama No. 9	236.1	Fixed	35.0	172
Georgia No. 100	269.6	Fixed	14.5	96.5

(1) Mileage above mouth of Coosa River measured along natural river channel.

(2) Bridge located across top of dam.

centers such as Talladega, Childersburg and Wetumpka in Alabama. It is estimated that over 1.2 million tons of commodities are presently available for movement over the waterway annually at a savings in transportation costs of over $1.7 million. With normal growth (without the stimulus of the various Appalachian programs) the movements are projected to increase to over 15 million tons annually by the year 2030 with annual savings of over $27 million. The project, during construction and after completion, would afford additional job opportunities and contribute substantially to the economic development of the surrounding area which has not achieved growth commensurate with the potential indicated by its natural and other resources.

The project would also have some impact on the economy of areas outside of Appalachia. There would be an increase in the movement of commodities through the port of Mobile resulting from shipments to and from the Coosa River area by way of the Mobile

River section of the Black Warrior and Tombigbee River Waterway and the Alabama River Waterway which will traverse the Selma and Montgomery growth areas.

Reservoirs formed by the existing Alabama Power Company dams on the Coosa River provide a total water surface area of about 80,000 acres under normal operating conditions. These reservoirs are used rather extensively for recreation and indications are that these activities will increase to more fully utilize the opportunities that are afforded. The installation of locks at the existing dams would provide access between all the reservoirs for expansion of boating and other recreational activities throughout the water areas, as well as adjacent lands, of the Coosa River and its impoundments.

The Coosa River project would be an integral part of the national transportation system. It would provide for the movement of a substantial volume of heavy and bulk commodities, and would improve the efficiency of the transportation system as a whole. This would be an especially important factor during time of National emergency.

4. COST ESTIMATE

The recommendations of the report in House Document No. 414, Seventy-seventh Congress, for a comprehensive plan of development of the Alabama-Coosa River basin, which were authorized by the River and Harbor Act of 1945, contemplated at that time, in addition to other basin improvements, six navigation locks and dams on the Alabama River, one navigation lock and dam on the Coosa River, locks at the then three existing Alabama Power Company dams on the Coosa, and six hydroelectric power dams on the Coosa with locks for navigation. As discussed previously, the navigation plans have been altered substantially since that time because of the increased requirements of inland waterway tows for efficient operation and the changes in physical conditions including those caused by subsequent developments on the Coosa by the Alabama Power Company. The recommendations of the authorization report, in part, were " - - - that for the initiation and partial accomplishment of the ultimate (basin) plan an expenditure of \$60 million be approved for the construction of navigation and power dams on the Alabama and Coosa Rivers - - - ." No division of project costs between the two rivers for navigation was given.

The latest report submitted to Congress for navigation on the Alabama-Coosa contained in House Document No. 320, Eighty-sixth Congress, estimated the total capital cost of the Coosa River navigation project at \$149,900,000. The quantities used in estimating project first costs for this current report have been based on plans and layouts developed from previous engineering studies and investigations, including subsurface explorations, which were revised to conform with current design

criteria and reflect present physical conditions. Unit prices that were applied to the quantities to obtain project costs are those for similar type work in the area in July 1967. Total costs have been escalated to January 1969 level by application of appropriate construction cost indices.

Interest during construction for the project as contemplated in House Document No. 320 was computed to be $5,610,000 based on a construction period of 3 years and interest at 2.5 percent, the rate prevailing at that time. Total investment was therefore estimated to be $155,510,000. Annual charges were computed at $6,058,000 including interest at 2.5 percent, amortization over 50 years, and operation and maintenance costs.

The present estimated financial and economic costs for the total project based on an interest rate of 3.25 percent are summarized below:

Feature	Costs (Jan 1969)	
	Financial	Economic
Federal first cost	$197,474,000	$191,163,000
Interest during construction	29,261,000	28,700,000
Total Federal investment	226,735,000	219,863,000
Non-Federal first cost	12,491,000	11,204,000
Interest during construction	406,000	364,000
Total non-Federal investment	12,897,000	11,568,000
Total project first cost	209,965,000	202,367,000
Interest during construction	29,667,000	29,064,000
Total project investment	239,632,000	231,431,000
Federal annual charges	9,941,000	9,743,000
Non-Federal annual charges	575,000	521,000
Total annual charges	10,516,000	10,264,000

Table 9-2 summarizes and compares costs presented in House Document 320, by major features and reaches of the waterway, with current estimates.

TABLE 9-2

SUMMARY OF CAPITAL AND INVESTMENT COSTS AND ANNUAL CHARGES

All costs are in $1,000

	Montgomery to Gadsden		Gadsden to Rome		Total Project	
	House Document No. 320	This report	House Document No. 320	This report	House Document No. 320	This report
Capital costs:						
Lands	-	115	-	-	-	115
Relocations	4,370	36,150	921	6,488	5,291	42,638
Locks	115,567	122,954	15,116	16,830	130,683	139,784
Channels	9,363	9,281	4,563	4,916	13,926	14,197
Total financial capital costs (Jul 67)	129,300	168,500	20,600	28,234	149,900	196,734
Total financial capital costs (Jan 69)	-	179,811	-	30,154	-	209,965
Total economic capital costs (Jan 69)	-	175,890	-	28,477	-	204,367
Interest during construction on economic costs	4,849	27,243	761	1,821	5,610	29,064
Total economic investment	134,149	203,133	21,361	30,298	155,510	233,431
Annual economic charges:						
Interest [1]	3,354	6,603	534	984	3,888	7,587
Amortization	1,377	1,671	219	250	1,596	1,921
Operation and maintenance	416	528	100	127	516	655
Major replacements	50	88	8	13	58	101
Total annual charges	5,197	8,890	861	1,374	6,058	10,264

[1] Includes adjustment for loss in productivity of land

5. BENEFITS

Benefits creditable to the project are in 5 categories, viz: savings in transportation charges on prospective barge-borne commerce; increase in recreational boating activities; increased employment, due to project construction, of labor that would otherwise be unemployed or underemployed; enhancement of land values due to shifts from agricultural to industrial use; and, developmental expansion. Methods of derivation of benefits are summarized in the ensuing paragraphs and detailed estimates of benefits are given in Section III of this chapter.

A traffic canvass and detailed economic surveys established zones of influence for the various benefit categories assignable to the Coosa River development. The primary impact area comprises 12 counties which are bisected by or lie adjacent to the waterway. Major navigation benefits would accrue to a 34-county area commercially tributary to the project as shown on exhibit 9-4, while other expansion or developmental benefits would be regional or national in scope.

The area considered to be commercially tributary to the Coosa River navigation project comprises 20 counties in northeast Alabama and 14 counties in northwest Georgia, with a combined area of about 18,000 square miles and with a 1960 population of 1,183,000. Navigation benefits would accrue to users of the waterway in the form of savings in transportation charges on barge commerce to and from this area, and related advantages. The potential savings to shippers were evaluated in accordance with standards and criteria provided in Section 7 (a) of the Department of Transportation Act of 1966 (Public Law 89-670), extracts of which are quoted in section III of this chapter.

The volume of prospective barge traffic used in evaluating navigation benefits is based on a traffic canvass conducted during 1967 by the Corps of Engineers, supplemented by special studies and surveys performed by private research firms and individuals under contract with the Corps of Engineers or with the Coosa-Alabama River Improvement Association. The area surveyed included Jefferson County, Alabama, and Hamilton County, Tennessee, in addition to the 34-county area previously described. Officials of over 600 firms were interviewed in connection with the surveys. Additional basic data were obtained from business and census publications and from various Government agencies. Results of the traffic canvass have been incorporated in section III of this chapter.

Savings to shippers via the Coosa River represent the difference between (a) freight rates or charges presently being assessed shippers for transportation from origin to destination via actual mode of transport in which commerce moves, and (b) estimated rates or charges that would probably be assessed for transportation on identical commerce moving via the Coosa River waterway. Alternative modes of transportation used

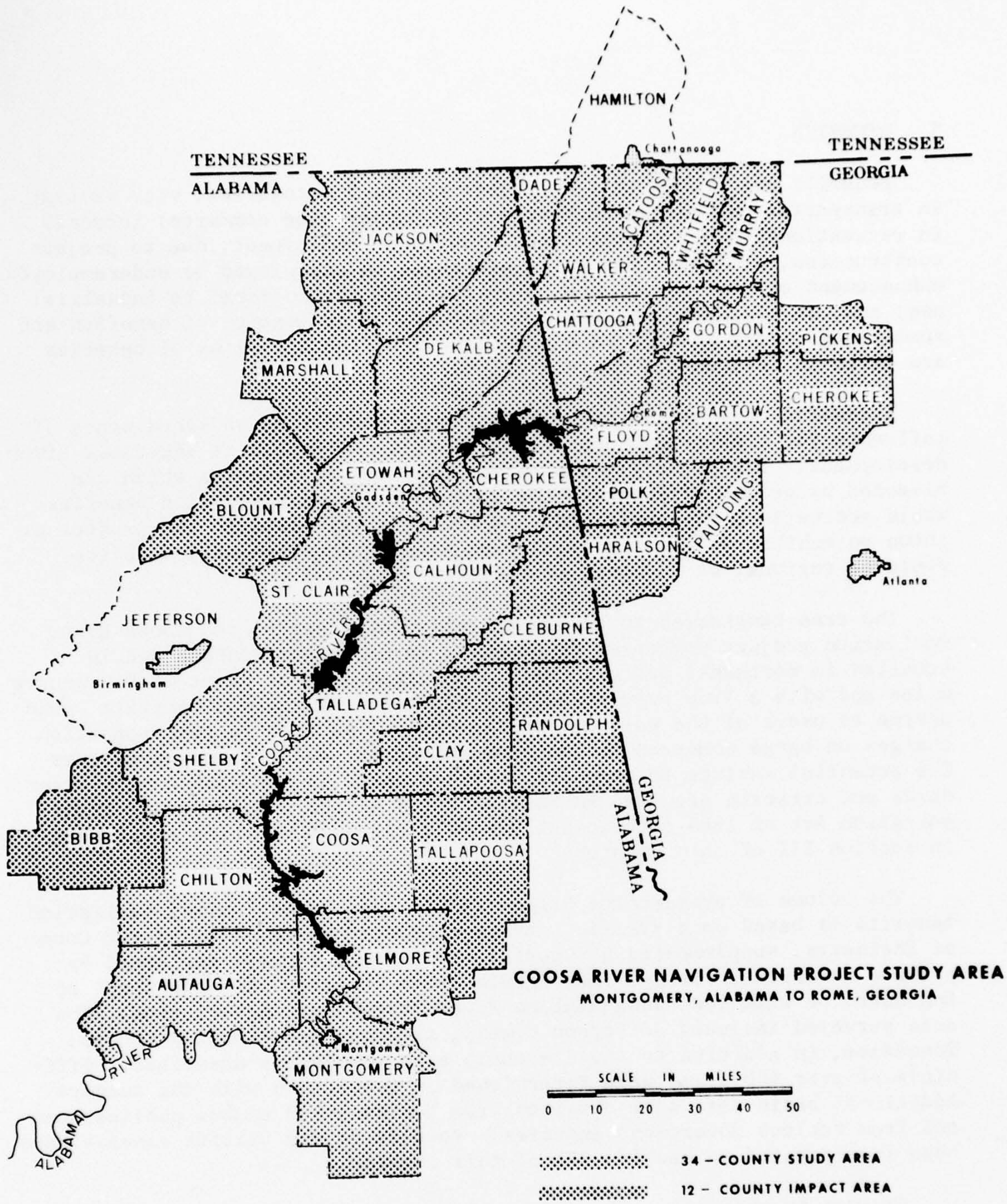

COOSA RIVER NAVIGATION PROJECT STUDY AREA
MONTGOMERY, ALABAMA TO ROME, GEORGIA
TENNESSEE
ALABAMA
TENNESSEE
GEORGIA
GEORGIA
ALABAMA
HAMILTON
Chattanooga
DADE
CATOOSA
WHITFIELD
MURRAY
JACKSON
WALKER
CHATTOOGA
GORDON
PICKENS
MARSHALL
DE KALB
BARTOW
CHEROKEE
Rome
FLOYD
ETOWAH
Gadsden
CHEROKEE
POLK
PAULDING
BLOUNT
HARALSON
Atlanta
CALHOUN
ST. CLAIR
JEFFERSON
CLEBURNE
Birmingham
TALLADEGA
RANDOLPH
SHELBY
COOSA
RIVER
CLAY
BIBB
COOSA
TALLAPOOSA
CHILTON
ELMORE
AUTAUGA
Montgomery
MONTGOMERY
ALABAMA RIVER
SCALE IN MILES
0 10 20 30 40 50
34 - COUNTY STUDY AREA
12 - COUNTY IMPACT AREA
OTHER COUNTIES
STATE BOUNDARY
COUNTY BOUNDARY

EXHIBIT 9-4

in estimating savings to shippers are those actually in use during the base-year, with consideration given to the competitive effects of the authorized Alabama River improvement to Montgomery, not yet completed.

Calendar year 1966, latest full year for which statistics on annual tonnages were available, was selected as "base-year" for the study of prospective waterway traffic. Base-year commerce developed by the traffic survey and selected for further analysis and itemized by commodity groups and tonnages. The data collected were screened to eliminate traffic that would not be adaptable to barge movement via the proposed waterway because of the nature of the commodity, circuity of routing, or for other reasons. The remainder, 2,112,000 tons, was then subjected to rate analyses to determine prospective annual tonnages and savings that would be applicable to base-year traffic. In this analysis, the base-year tonnage on which savings in transportation costs would be realized was determined to be about 1,100,000 tons for the waterway with improvement to Gadsden, and over 1,200,000 tons with improvement to Rome. The resulting base-year savings would be $1,547,300 for the improvement to Gadsden, and $1,721,300 for the improvement to Rome.

In order to estimate the volume of commerce and the related savings that might be expected over the life of the project (1980-2030), a study was made for the purpose of projecting future economic growths or changes for the tributary area. The study utilized the economic indicators, both local and national, together with a set of projection factors which were applied to the appropriate base-year tonnages*/ of prospective waterway traffic. Projected tonnages and savings for selected years are summarized in table 9-3.

*/ All projections should be construed as indicitive of the probable growth of industries rather than specific firms or plants located on or near the Coosa River.

TABLE 9-3

PROJECTED ANNUAL TONNAGES AND SAVINGS FOR SELECTED YEARS DURING LIFE OF PROJECT

Year	Improvement to Gadsden Tons	Improvement to Gadsden Savings	Improvement to Rome Tons	Improvement to Rome Savings
1966 [1]	1,062,100	$1,547,300	1,234,100	$1,721,300
1980 [2]	2,046,800	2,914,600	2,394,100	3,267,300
1990	3,096,000	4,690,600	3,633,700	5,240,200
2000	4,608,300	7,614,000	5,469,000	8,518,300
2010	6,472,300	11,416,000	7,813,300	12,822,700
2020	8,950,000	16,645,200	11,020,400	18,780,900
2030 [3]	12,475,000	24,391,100	15,670,800	27,637,100
Average annual equivalent		8,369,000	-	9,404,000

[1] Base year
[2] Beginning of project life
[3] End of 50-year project life

The average annual equivalent transportation benefits or savings for the improvement considered for the Coosa River navigation project, based on a 50-year project life (1980-2030) and a discount rate of 3¼%, would be as follows:

Montgomery to Gadsden	$8,369,000
Gadsden to Rome (incremental)	1,035,000
Montgomery to Rome	9,404,000

Recreational boating benefits have been evaluated on the basis that the value of such benefits bears a percentage relationship to the value of the boats used. The enhancement in recreational boating arises from the fact that the existing series of power company pools between Montgomery and Gadsden would be converted to a continuous waterway connection, through the Alabama River waterway to Mobile, with the nation's inland waterway system, thereby permitting longer cruises. Average annual equivalent benefits are summarized as follows:

Montgomery to Gadsden	$367,000
Gadsden to Rome	234,000
Total (Montgomery to Rome)	601,000

Redevelopment benefits were analyzed for the Coosa Navigation project to determine their influence on the project study area. Redevelopment benefits included in this report are measured in terms of wages and salaries occurring from the economic activity induced by construction of the project and its operation and maintenance. Benefits credited to the regional account consist of the average annual equivalent of all labor costs used in construction and operation and maintenance of the waterway. Benefits credited to the national account are the wage payments made to persons who would otherwise be unemployed or underemployed; live in the project area within commuting distance of the project; and, possess the necessary skills required for project construction. The following tabulation shows the average annual redevelopment benefits creditable to the national and regional accounts.

Reach	Annual Redevelopment Benefits ($1,000) National account	Regional account
Montgomery-Gadsden	1,036	1,584
Gadsden-Rome	173	271
Total (Montgomery to Rome)	1,209	1,855

Provision of a navigation project along the Coosa River will generate a shift in land use with consequent appreciation of land values. Land enhancement benefits were evaluated herein for those areas required for traffic which would be induced by the waterway. This traffic has been identified and evaluated and is composed of various chemical products and iron and steel items.

It is estimated that the demand for additional acreage will begin in the first year of the project life and increase over the 50-year project life at the same rate as the tonnage for the commodity for which the additional land requirements is computed. Area required at the end of the period is estimated at 1,773 acres. All sites lie along the waterway and have rail and highway access. The economic impact study (Section IV) identifies the availability of over 60,800 acres of potential industrial land along the Coosa River. The average annual equivalent value of the land enhancement benefits derived herein is $176,000.

Associated with the shift in land use is the induced growth of new industries and services and their generation of wages in this area. The additional employment in the chemical and steel industry was estimated and converted to income gains. A multiplier effect was used to develop similar gains in other employment. These new regional wage benefits for the period 1980 to 2030 have an accumulated present worth of $680 million and an average annual equivalent value of $54.6 million. National wage benefits reflecting a 20-year time horizon have a present worth of $65.8 million and an average annual equivalent value of $2.7 million. It was determined that new growth would be limited to the waterway reach, Montgomery to Gadsden, and developmental benefits would be attributable to that reach, only. These benefits are shown below:

Account	Benefits
Regional only	$51,900,000
National	2,700,000
National and Regional	2,700,000
Total Regional	54,600,000

The Coosa River Navigation project will also create benefits of an intangible nature which will have a significant influence on the economic structure and growth of the area but are not susceptible to monetary evaluation. One is its effect on the over-all national transportation system. The waterway will open a new competitive mode of transportation from the Gulf of Mexico through the Port of Mobile and the industrial and agricultural centers of the south and mid-west to the Appalachia portion of Alabama, Georgia and Tennessee. The project will provide barge transportation for bulk commodities for such industries as food processing, textiles, paper, chemicals, petroleum and primary metals. In creating an additional means of transportation for the movement of heavy and bulk freight it would increase the capacity and over-all efficiency of the national and regional transportation systems.

The total annual benefits (user and expansion) that will accrue to the plan of development are shown in table 9-4.

TABLE 9-4

SUMMARY OF USER AND EXPANSION BENEFITS ($1,000)

Category and class of benefits	Annual Benefits: Regional account only	National and regional account	Total national account	Total regional account
	Montgomery - Rome			
User benefits				
Navigation	-	9,404	9,404	9,404
Recreational boating	-	601	601	601
Total user benefits	-	10,005	10,005	10,005
Expansion benefits				
Redevelopment	646	1,209	1,209	1,855
Developmental wages	51,900	2,700	2,700	54,600
Land enhancement	176	-	-	176
Total expansion benefits	52,722	3,909	3,909	56,631
	Montgomery - Gadsden			
User benefits				
Navigation	-	8,369	8,369	8,369
Recreational boating	-	367	367	367
Total user benefits	-	8,736	8,736	8,736
Expansion benefits				
Redevelopment	548	1,036	1,036	1,584
Developmental wages	51,900	2,700	2,700	54,600
Land enhancement	176	-	-	176
Total expansion benefits	52,624	3,736	3,736	56,360
	Gadsden - Rome			
User benefits				
Navigation	-	1,035	1,035	1,035
Recreational boating	-	234	234	234
Total user benefits	-	1,269	1,269	1,269
Expansion benefits				
Redevelopment	98	173	173	271

6. COST - BENEFIT COMPARISON

Project performance is measured by current economic standards which indicate the minimum national and regional relationships of benefits and costs. The derivation of project economic and developmental costs is given in Section II and a summary is shown in table 9-5. The derivation of navigation and developmental benefits is given in Section III and a summary is shown in table 9-6

Table 9-5

SUMMARY OF ANNUAL ECONOMIC CHARGES ($1,000)

	Montgomery to Gadsden	Gadsden to Rome	Montgomery to Rome
Annual economic charges			
Navigation project	8,890	1,374	10,264
Developmental	14,490	-	14,490
Total annual charges	23,380	1,374	24,754

Table 9-6

SUMMARY OF ANNUAL BENEFITS ($1,000)

	Montgomery to Gadsden		Gadsden to Rome		Montgomery to Rome	
	National	Regional	National	Regional	National	Regional
User benefits	8,736	8,736	1,269	1,269	10,005	10,005
Redevelopment	1,036	1,584	173	271	1,209	1,855
User plus redevelopment	9,772	10,320	1,442	1,540	11,214	11,860
Developmental and land enhancement	2,700	52,076	-	-	2,700	54,776
Expansion	3,736	52,624	173	271	3,909	56,631

The national performance index reflects the ratio of the resulting national income expansion to the economic cost of the Coosa River Navigation project. The numerator in this relationship contains annual user (transportation savings, recreational boating and wages due directly to project construction, operation and maintenance) benefits. The latter (wages) have previously been described as redevelopment benefits. The denominator indicates the annual economic cost of the project.

NATIONAL PERFORMANCE INDICES

Project reach	Ratio in $1,000	Performance index
Montgomery to Gadsden	9,772/8,890	1.1
Gadsden to Rome	1,442/1,374	1.05
Montgomery to Rome	11,214/10,264	1.1

The regional performance index shows the relative contribution of the Coosa River project to increased employment and utilization of skills as compared to total annual costs, both public and private, of the development plan. The numerator represents regional expansion benefits, i.e., increased wages due to project construction, operation, and maintenance, plus wages due to project-induced private investment. The denominator is the annual cost, both public and private, necessary to accomplish the objectives of the total development plan.

REGIONAL PERFORMANCE INDICES

Project reach	Ratio in $1,000	Performance index
Montgomery to Gadsden	52,624/23,380	2.3
Gadsden to Rome	271/1,374	0.2
Montgomery to Rome	56,631/24,754	2.3

7. COST SHARING

Apportionment of project costs to Federal and non-Federal interests was made in accordance with the project authority. Federal costs would include the navigation structures, channel works and portions of the highway and railroad relocation costs in accordance with the Act of 21 June 1940 (Truman-Hobbs Act). Non-Federal interests would be required to share in the costs of relocations involving highway and railroad crossings and assume the full cost of certain betterments occasioned by the waterway. They would provide lands required for spoil areas and relocations, and would bear the entire cost of the channel and turning basin on Black Creek at Gadsden.

A summary of capital and annual costs allocated to Federal and non-Federal interests is shown in table 9-7. Both financial and economic costs are listed. These costs are itemized by project reaches and by individual structures in section II.

TABLE 9-7

ALLOCATION OF FEDERAL AND NON-FEDERAL
CAPITAL AND ANNUAL COSTS ($1,000)

January 1969 Prices

	Montgomery to Gadsden		Gadsden to Rome		Montgomery to Rome	
	Financial	Economic	Financial	Economic	Financial	Economic
CAPITAL COSTS						
Federal	168,470	165,590	29,004	27,573	197,474	193,163
Non-Federal	11,341	10,300	1,150	904	12,491	11,204
Total project	179,811	175,890	30,154	28,477	209,965	204,367
ANNUAL COSTS						
Federal	8,548	8,412	1,393	1,331	9,941	9,743
Non-Federal	521	478	54	43	575	521
Total project	9,069	8,890	1,447	1,374	10,516	10,264

Developmental costs, further explained in section II, are based on investment required by private interests for traffic that would be induced by the waterway. Present worth of capital investment required over the

50-year economic life of the project is estimated at $264,536,000. Average annual equivalent value is $14,490,000 based on interest rate applicable to private investment. All developmental costs are apportioned to non-Federal interests.

8. REQUIREMENTS AND ASSURANCES FOR LOCAL COOPERATION

Requirements. - The River and Harbor Act authorizing the comprehensive development of the Alabama-Coosa River system did not stipulate specific items of local cooperation. The authorizing Act indicates, however, that the requirements of local cooperation, as well as detailed construction plans, are to be formulated as the development of the improvement progresses. The following requirements are considered to apply: (a) Provide without cost to the United States all land, easements and rights-of-way required for construction and subsequent maintenance of the project and for aids to navigation upon the request of the Chief of Engineers, including suitable areas determined by the Chief of Engineers to be required in the general public interest for initial and subsequent disposal of spoil; (b) Provide and maintain at local expense, when and as needed, adequate public terminal and transfer facilities open to all on equal terms; (c) Provide and maintain without cost to the United States, depths suitable for barge traffic in berthing areas and local access channels, including an access channel in Black Creek, and necessary bridge and utility alterations therein, to the site of the proposed Republic Steel Corporation docks; (d) Assume the local share of the cost for alterations of bridges determined in accordance with the principles of Section 6 of Public Law 647, 76th Congress, approved 21 June 1940, as amended (Truman-Hobbs Act); and (e) Furnish free of cost to the United States power for operation and maintenance of navigation facilities.

Items (a) and (e) are included in the terms of the license granted the Alabama Power Company by the Federal Power Commission. Item (b) is required by Section 1 of the River and Harbor Act approved 2 March 1919. Item (c) is required to insure accrual of the navigation "user" benefits. Item (d) was recommended to Congress by the Chief of Engineers in the report on the Alabama-Coosa Rivers printed in House Document No. 320, 86th Congress, 2nd session. As to item (e), the Act of 28 June 1954, Public Law 436, 83rd Congress, provides certain stipulations relating to the adaptability of the privately constructed reservoir projects for navigational development on the Coosa River. It stated subsequent licensing of those projects required compliance with the provisions of the Act in providing construction lands and operational power for the navigation locks and lands for navigation channel works.

Assurances. - Letters of intent from the Governors of Alabama and Georgia have been received, both stating that the requirements will be provided at the time requested by the Corps of Engineers, in accordance with applicable legislative authority governing the project. The letters are included as exhibits at the end of this section. These assurances are considered to be satisfactory.

9. COORDINATION OF PLANNING

The Coosa Navigation project, which consists of only the provision of navigation locks at existing privately owned dams, was coordinated with all agencies that might have an interest in the effects the project could have on their activities. This was done both on an informal and formal basis. Contacts were made with Bureau of Outdoor Recreation, Federal Water Pollution Control Administration, Bureau of Sport Fisheries and Wildlife, Bureau of Public Roads, Maritime Administration, National Parks Service, Public Health Service, and related State agencies. The general consensus was that the addition of locks to these structures would not adversely affect any of their activities. However, the FWPCA in commenting stated they had concerns about the proposal to cut Mayo's Bar, an old unused partially destroyed lock and dam on the Coosa just west of Rome, Georgia. They discussed this problem with the Georgia State Water Quality Control Board and concluded that for planning purposes no problems could be foreseen in terms of water quality by the removal of Mayo's Bar. This conclusion was drawn from observations of existing conditions of water quality above and below the bar, together with conditions at the bar itself. Further coordination will be required with all agencies and others concerned during the final planning stage should the navigation project be constructed.

10. CONCLUSIONS

The total fall of the Coosa River has been developed by several dams constructed by private interests for the development of hydropower. This provides a continuous system of reservoirs on the Coosa River from Wetumpka to Rome, Georgia. The Coosa River Navigation project consists of providing single-lift navigation locks at these existing privately owned dams. The navigation channel, nine feet deep and 150 feet wide, would extend for a distance of 280 miles from the head of navigation on the Alabama River Waterway to Rome, Georgia. The project would provide an additional economic means of transporting heavy and bulk commodities to and from the tributary area along the Coosa River in and adjacent to Sub-region E. This includes the growth center of Rome, Georgia and the Gadsden and Anniston Centers in Alabama. Also, included are smaller centers such as Talladega, Childersburg and Wetumpka, Alabama. Montgomery, Alabama, just outside the region is in the tributary area, also. The project would have direct impact on the areas south of Sub-region E by increasing the movements of commodities between the sub-region and the Port of Mobile

over the Alabama River Waterway and the Tennessee-Tombigbee Waterway (when constructed).

The large existing reservoirs on the Coosa afford many and varied recreational opportunities. The construction of locks at the Coosa River dams will greatly enhance these opportunities by providing a direct, continuous waterway stretching from Rome, Georgia, to the Gulf of Mexico where it would connect with the intracoastal and inland waterway systems.

The Coosa Navigation project will be an asset to the overall national transportation system by providing a connecting transportation link from the Appalachia region of north Alabama and Georgia and Tennessee (Sub-region E and adjacent areas) with the world and continental ports through the Port of Mobile and to the industrial and agricultural centers of the south and midwest. Thus the expected stimulated economic growth and development of this area will have a direct bearing on the national economy.

The area commercially tributary to the navigation project covers about 18,000 square miles with a population of 1,183,000. Primary navigation benefits will accrue to the waterway in the form of savings in transportation charges, increased recreational boating activities, and economic redevelopment. Traffic surveys and freight rate analyses disclosed that about 1,234,000 tons of freight was available in 1966 for movement on the waterway at an estimated savings of $1,721,000. Projected along a normal growth curve, the tonnage and savings would reach 15,671,000 tons and $27,637,000, respectively, by year 2030 (end of project life). Average annual equivalent savings in transportation charges are computed at $9,404,000. Recreational boating benefits are estimated at $601,000. Redevelopment benefits creditable to the national account, representing wages paid to local labor for construction, operation, and maintenance of the project, which would otherwise be unemployed or underemployed, are estimated at $1,209,000. Thus from a national performance viewpoint, the average annual equivalent benefits total $11,214,000. In considering developmental benefits the navigation project was assumed to have an impact on a 12-county area of which 11 are in Sub-region E. The redevelopment and developmental expansion benefits, including land enhancement, creditable to the regional account are estimated herein at $56,631,000 annually. The annual economic charges are estimated to be $10,264,000 for the navigation project and $24,754,000 for the total plan, including the navigation project and developmental plan. Indices of national and regional performance are 1.1 and 2.3, respectively.

The Coosa Navigation project as has been shown will contribute to the economic development and growth of the nation as well as Sub-region E of the Appalachian Region. It will also influence directly and indirectly the activities of other regions in Appalachia and the industrial and agricultural centers of southern and the midwestern United States by offering a low-cost transportation system. Economic growth in the tributary area, after construction of the waterway, will offer an increasing number of job opportunities ranging from unskilled to managerial. This increase in employment opportunities in the waterway-oriented industries, along with the resulting increases in population, would generate the growth and development of other facets of industrial and commercial activities in the area. The project meets all Appalachian growth requirements by affording a means of stimulating economic development.

The states of Alabama and Georgia have for many years endorsed the development of the Coosa River for navigation to Rome. These states have furnished assurances that the non-Federal responsibilities with respect to project costs will be met when required, and urged that high priority be given to construction of the waterway.

STATE OF ALABAMA

GOVERNOR'S OFFICE

MONTGOMERY

ALBERT P. BREWER
GOVERNOR

September 12, 1969

Colonel Robert E. Snetzer
District Engineer
Corps of Engineers
Post Office Box 2288
Mobile, Alabama 36601

Dear Colonel Snetzer:

This will certify assurance of the capability and willingness of the State of Alabama to provide the requirements of local cooperation outlined in your letter of 27 August 1969 in regard to the Coosa River. These requirements will be provided at the time requested by the District Engineer, U.S. Army Corps of Engineers, in accordance with applicable legislative authority governing the project.

Sincerely yours,

Albert P. Brewer

Albert P. Brewer
Governor

APB:ah

Exhibit 9-5

Executive Department
Atlanta

Lester Maddox
GOVERNOR

Zell Miller
EXECUTIVE SECRETARY

September 9, 1969

Colonel Robert E. Snetzer
District Engineer
U. S. Army Engineer District, Mobile
P. O. Box 2288
Mobile, Alabama 36601

Dear Colonel Snetzer:

This will certify assurance of the capability and willingness of the State of Georgia to provide the requirements of local cooperation outlined in your letter of August 27, 1968, in regard to the Coosa River. These requirements will be provided at the time requested by the District Engineers, in accordance with applicable legislative authority governing the project.

I am vitally interested in this project. It will stimulate the economy of a region of Georgia which has not experienced growth commesurate with the potential indicated by its natural and other resources, as you so aptly pointed out in your letter. I concur also that the waterway would enhance recreational potentials of existing reservoirs on the Coosa River and provide other benefits.

The State of Georgia can be committed to the expenditure of funds only through action of the State Legislature. An agreement to that effect, therefore, would be a matter for consideration by the Legislature prior to construction when details of the plans are finalized.

Sincerely,

Lester Maddox
Governor

LM:kw

Exhibit 9-6

SECTION II - COSTS

11. INTRODUCTION

This section contains detailed estimates of Federal and non-Federal capital and developmental costs and annual charges for the Coosa River navigation project. Separate estimates are presented for the two reach components - Montgomery to Gadsden, and Gadsden to Rome. Detailed estimates are based on July 1967 prices; however, total costs have been escalated to January 1969 in the summary tables, so as to make costs and benefits on the same time basis.

12. NAVIGATION PROJECT

The total capital cost of the waterway from Montgomery, Alabama, to Rome, Georgia is estimated at $209,965,000 of which $179,811,000 would be the cost of the Montgomery-Gadsden segment and $30,154,000 for the Gadsden-Rome reach. Detailed cost estimates for individual structures were based on layouts on file in the Mobile District, Corps of Engineers, and on recent appraisals of relocation costs. These estimates are presented in tables in this section.

Interest during construction is based on 3.25 percent for one-half of the period of construction. The Federal construction periods were assumed to be ten years on the Montgomery-to-Gadsden portion of the waterway and four years on the Gadsden-to-Rome portion. Non-Federal construction periods were taken to be two years for each portion. Annual charges on the Federal and non-Federal investment costs are computed at 3.25 percent amortized for a period of 50 years. Estimates of Federal operation and maintenance costs are based on required lock operating personnel wages and supplies and channel maintenance. Major replacement costs for the Federal works were estimated for the various lock components for which replacement would be required during the project life. Non-Federal operation and maintenance costs are comprised of estimated annual wages and supplies for non-self-liquidating betterments necessitated by the project. Annual economic costs are less than the financial costs primarily because the navigation project is charged for "replacement-in-kind" for bridge alterations. Financial costs assume that bridge replacements will be in accordance with new standards by the Bureau of Public Roads rather than constructing narrower bridges of the kind now in place.

TABLE 9-8

SUMMARY OF CAPITAL COST

MONTGOMERY TO GADSDEN
(July 1967 prices)

No.	Item	Cost
FEDERAL:		
1.	Relocations	$ 25,002,000
2.	Locks	111,789,000
3.	Channels	6,440,000
4.	Engineering and design	5,721,000
5.	Supervision and administration	8,583,000
	SUB-TOTAL FEDERAL PROJECT COST	157,535,000
	SUB-TOTAL FEDERAL PROJECT COST ESCALATED TO JAN 69	168,405,000
	Aids to navigation (U.S. Coast Guard)	65,000
	TOTAL FEDERAL PROJECT COST	157,600,000
	TOTAL FEDERAL PROJECT COST ESCALATED TO JAN 69	168,470,000
NON-FEDERAL:		
6.	Lands	115,000
7.	Relocations	7,200,000
8.	Basin and wharf	1,776,000
9.	Engineering and design	1,043,000
10.	Supervision and administration	766,000
	TOTAL NON-FEDERAL PROJECT COST	10,900,000
	TOTAL NON-FEDERAL PROJECT COST ESCALATED TO JAN 69	11,341,000
	TOTAL PROJECT CAPITAL COST	168,500,000
	TOTAL PROJECT CAPITAL COST ESCALATED TO JAN 69	179,811,000

TABLE 9-9

SUMMARY OF CAPITAL COST

GADSDEN TO ROME
(July 1967 prices)

No.	Item	Cost
FEDERAL:		
1.	Relocations	$ 4,804,000
2.	Locks	15,005,000
3.	Channels	4,351,000
4.	Engineering and design	1,348,000
5.	Supervision and administration	1,592,000
	SUB-TOTAL FEDERAL PROJECT COST	27,100,000
	SUB-TOTAL FEDERAL PROJECT COST ESCALATED TO JAN 69	28,970,000
	Aids to navigation (U. S. Coast Guard)	34,000
	TOTAL FEDERAL PROJECT COST	27,134,000
	TOTAL FEDERAL PROJECT COST ESCALATED TO JAN 69	29,004,000
NON-FEDERAL:		
6.	Relocations	940,000
7.	Engineering and design	80,000
8.	Supervision and administration	80,000
	TOTAL NON-FEDERAL PROJECT COST	1,100,000
	TOTAL NON-FEDERAL PROJECT COST ESCALATED TO JAN 69	1,150,000
	TOTAL PROJECT CAPITAL COST	28,234,000
	TOTAL PROJECT CAPITAL COST ESCALATED TO JAN 69	30,154,000

TABLE 9-10

SUMMARY OF ANNUAL COST

MONTGOMERY TO GADSDEN
(January 1969 prices)

No.	Item	Financial	Economic[1]
FEDERAL:			
1.	Interest on gross investment	$6,364,000	$6,256,000
2.	Amortization of net investment	1,612,000	1,584,000
3.	Maintenance and operation	484,000	484,000
4.	Major replacements	88,000	88,000
	TOTAL FEDERAL COST	8,548,000	8,412,000
NON-FEDERAL:			
5.	Interest on gross investment	381,000	347,000
6.	Amortization of net investment	96,000	87,000
7.	Maintenance and operation	44,000	44,000
	TOTAL NON-FEDERAL COST	521,000	478,000
	TOTAL ANNUAL COST	9,069,000	8,890,000

[1] Economic costs, as used throughout this chapter, differ from the financial costs because of estimates of betterment; this is described in paragraph 12, page III-9-31.

TABLE 9-11

SUMMARY OF ANNUAL COST

GADSDEN TO ROME
(January 1969 prices)

No.	Item	Financial	Economic
FEDERAL:			
1.	Interest on gross investment	$1,004,000	$ 954,000
2.	Amortization of net investment	254,000	242,000
3.	Maintenance and operation	122,000	122,000
4.	Major replacements	13,000	13,000
	TOTAL FEDERAL COST	1,393,000	1,331,000
NON-FEDERAL:			
5.	Interest on gross investment	39,000	30,000
6.	Amortization of net investment	10,000	8,000
7.	Maintenance and operations	5,000	5,000
	TOTAL NON-FEDERAL COST	54,000	43,000
	TOTAL ANNUAL COST	1,447,000	1,374,000

TABLE 9-12

DETAILED ESTIMATE OF CAPITAL COST
(MONTGOMERY TO GADSDEN)

Item	Unit	Quantity	Unit price	Amount
FEDERAL				
1. RELOCATIONS				
Railroad bridges:				
Southern	L.S.	2	-	$3,604,500
Central of Georgia	L.S.	1	-	1,831,700
Seaboard Coast Line	L.S.	1	-	2,015,700
Seaboard Coast Line	L.S.	1	-	1,711,100
Louisville & Nashville	L.S.	1	-	2,115,500
Highway bridges:				
U. S. Highway No. 231 and No. 280	L.S.	1	-	1,114,500
U. S. Highway I-20	L.S.	1	-	1,543,200
U. S. Highway No. 78	L.S.	1	-	1,141,300
U. S. Highway No. 431	L.S.	2	-	3,118,200
Alabama Highway No. 34	L.S.	1	-	788,200
Alabama Highway No. 77	L.S.	1	-	1,101,200
Talladega County No. 70	L.S.	1	-	1,287,600
Utilities:				
Power and communication lines	L.S.			368,500
Contingencies at 15 percent				3,260,800
TOTAL, RELOCATIONS				25,002,000
2. LOCKS				
Walter Bouldin:				
Cofferdam and pumping	L.S.	-	-	3,766,000
Clearing	Acre	104	$400.00	41,600
Excavation, common	C.Y.	1,655,900	.75	1,241,900
Excavation, rock	C.Y.	1,574,000	1.75	2,754,500
Backfill, compacted	C.Y.	1,150,000	0.40	460,000
Wood bearing piles	L.F.	22,830	3.50	79,900
Removing and replacing dam structures	L.S.	-	-	632,000

TABLE 9-12 (cont'd)

DETAILED ESTIMATE OF CAPITAL COST
(MONTGOMERY TO GADSDEN)

Item	Unit	Quantity	Unit price	Amount
Walter Bouldin (cont'd)				
Concrete	C.Y.	1,001,200	$ 18.00	$18,021,600
Drilling grout holes	L.F.	7,600	5.00	38,000
Grout	C.F.	3,800	9.50	36,100
Steel reinforcement	Tons	2,618	300.00	785,400
Miscellaneous metal	Tons	82	1,200.00	98,400
Wall armor	Tons	463	800.00	370,400
Parapet wall and railing	L.S.	-	-	150,000
Upper miter gate	Tons	229	1,200.00	274,800
Lower miter gate	Tons	882	1,200.00	1,058,400
Miter gate machinery	L.S.	-	-	140,000
Tainter valves	Each	4	65,000.00	260,000
Tainter value machinery	L.S.	-	-	200,000
Stoplogs and pickup beam	L.S.	-	-	300,000
Hydraulic system	L.S.	-	-	120,000
Compressed air and water systems	L.S.	-	-	50,000
Culvert bulkheads	Each	4	20,500.00	102,000
Grating	L.S.	-	-	45,000
Floating mooring bitts, complete	L.S.	-	-	74,000
Electrical system	L.S.	-	-	250,000
Control station and operation booths	L.S.	-	-	90,000
Contingencies at 15 percent				4,716,000
Subtotal				36,156,000
Mitchell:				
Cofferdam and pumping	L.S.	-	-	4,490,000
Clearing	Acre	11	400.00	4,400
Excavation, common	C.Y.	23,200	0.75	17,400
Excavation, rock	C.Y.	957,000	2.00	1,914,000
Backfill, compacted	C.Y.	81,200	1.00	81,200
Concrete	C.Y.	320,700	24.00	7,696,800
Drilling grout holes	L.F.	7,600	5.00	38,000
Grout	C.F.	3,800	9.50	36,100
Steel reinforcement	Tons	1,250	300.00	375,000
Miscellaneous metal	Tons	44	1,200.00	52,800
Wall armor	Tons	267	800.00	213,600
Parapet wall and railing	L.S.	-	-	150,000
Upper miter gate	Tons	159	1,200.00	190,800
Lower miter gate	Tons	547	1,200.00	656,400

TABLE 9-12 (cont'd)

DETAILED ESTIMATE OF CAPITAL COST
(MONTGOMERY TO GADSDEN)

Item	Unit	Quantity	Unit price	Amount
Mitchell (cont'd)				
Miter gate machinery	L.S.	-	-	$ 140,000
Tainter valves	Each	4	$51,000.00	204,000
Tainter valve machinery	L.S.	-	-	145,000
Stoplogs and pickup beam	L.S.	-	-	300,000
Hydraulic system	L.S.	-	-	120,000
Compressed air and water systems	L.S.	-	-	50,000
Culvert bulkheads	Each	4	17,000.00	68,000
Grating	L.S.	-	-	45,000
Floating mooring bitts, complete	L.S.	-	-	68,000
Electrical system	L.S.	-	-	250,000
Control station and operation booths	L.S.	-	-	90,000
Contingencies at 15 percent				2,609,500
Subtotal				20,006,000
Lay:				
Cofferdam and pumping	L.S.	-	-	2,947,000
Clearing	Acre	20	400.00	8,000
Excavation, common	C.Y.	35,000	0.75	26,300
Excavation, rock	C.Y.	881,400	2.00	1,762,800
Backfill, compacted	C.Y.	136,000	1.00	136,000
Removing and replacing dam structures	L.S.	-	-	391,100
Concrete	C.Y.	465,300	22.00	10,236,600
Drilling grout holes	L.F.	7,600	5.00	38,000
Grout	C.F.	3,800	9.50	36,100
Steel reinforcement	Tons	1,394	300.00	418,200
Miscellaneous metal	Tons	52	1,200.00	62,400
Wall armor	Tons	329	800.00	263,200
Parapet wall and railing	L.S.	-	-	150,000
Upper miter gate	Tons	189	1,200.00	226,800
Lower miter gate	Tons	653	1,200.00	783,600
Miter gate machinery	L.S.	-	-	140,000
Tainter valves	Each	4	55,500.00	222,000
Tainter valve machinery	L.S.	-	-	162,000
Stoplogs and pickup beam	L.S.	-	-	300,000
Hydraulic system	L.S.	-	-	120,000
Compressed air and water systems	L.S.	-	-	50,000

TABLE 9-12 (cont'd)

DETAILED ESTIMATE OF CAPITAL COST
(MONTGOMERY TO GADSDEN)

Item	Unit	Quantity	Unit price	Amount
Lay (cont'd)				
Culvert bulkheads	Each	4	$20,000.00	$ 80,000
Grating	L.S.	-	-	45,000
Floating mooring bitts, complete	L.S.	-	-	74,000
Electrical system	L.S.	-	-	250,000
Control station and operation booths	L.S.	-	-	90,000
Contingencies at 15 percent				2,852,900
Subtotal				21,872,000
Logan Martin:				
Cofferdam and pumping	L.S.	-	-	3,817,000
Clearing	Acre	15	400.00	6,000
Excavation, common	C.Y.	452,200	0.75	339,200
Excavation, rock	C.Y.	154,900	2.00	309,800
Backfill, compacted	C.Y.	140,700	1.00	140,700
Wood bearing piles	L.F.	22,400	3.50	78,400
Removing and replacing dam structures	L.S.	-	-	455,900
Concrete	C.Y.	346,900	24.00	8,325,600
Drilling grout holes	L.F.	7,600	5.00	38,000
Grout	C.F.	11,300	9.50	107,400
Steel reinforcement	Tons	1,139	300.00	341,700
Miscellaneous metal	Tons	43	1,200.00	51,600
Wall armor	Tons	264	800.00	211,200
Parapet wall and railing	L.S.	-	-	150,000
Upper miter gate	Tons	253	1,200.00	303,600
Lower miter gate	Tons	541	1,200.00	649,200
Miter gate machinery	L.S.	-	-	140,000
Tainter valves	Each	4	53,125.00	212,500
Tainter valve machinery	L.S.	-	-	152,500
Stoplogs and pickup beam	L.S.	-	-	300,000
Hydraulic system	L.S.	-	-	120,000
Compressed air and water systems	L.S.	-	-	50,000
Culvert bulkheads	Each	4	16,900.00	67,600
Grating	L.S.	-	-	45,000
Floating mooring bitts, complete	L.S.	-	-	68,000
Electrical system	L.S.	-	-	250,000
Control station and operation booths	L.S.	-	-	90,000
Contingencies at 15 percent				2,523,100
Subtotal				19,344,000

TABLE 9-12 (cont'd)

DETAILED ESTIMATE OF CAPITAL COST
(MONTGOMERY TO GADSDEN)

Item	Unit	Quantity	Unit price	Amount
H. Neely Henry:				
Cofferdam and pumping	L.S.	-	-	$2,612,000
Clearing	Acre	11	$400.00	4,400
Excavation, common	C.Y.	331,200	0.75	248,400
Excavation, rock	C.Y.	187,200	2.00	374,400
Backfill, compacted	C.Y.	95,500	1.00	95,500
Removing and replacing dam structures	L.S.	-	-	268,600
Concrete	C.Y.	230,100	26.00	5,982,600
Drilling grout holes	L.F.	7,600	5.00	38,000
Grout	C.F.	11,300	9.50	107,400
Steel reinforcement	Tons	862	300.00	258,600
Miscellaneous metal	Tons	33	1,200.00	39,600
Wall armor	Tons	192	800.00	153,600
Parapet wall and railing	L.S.	-	-	150,000
Upper miter gate	Tons	294	1,200.00	352,800
Lower miter gate	Tons	417	1,200.00	500,400
Miter gate machinery	L.S.	-	-	140,000
Tainter valves	Each	4	40,000.00	160,000
Tainter valve machinery	L.S.	-	-	100,000
Stoplogs and pickup beam	L.S.	-	-	300,000
Hydraulic system	L.S.	-	-	120,000
Compressed air and water systems	L.S.	-	-	50,000
Culvert bulkheads	Each	4	10,000.00	40,000
Grating	L.S.	-	-	45,000
Floating mooring bitts, complete	L.S.	-	-	50,000
Electrical system	L.S.	-	-	250,000
Control station and operation booths	L.S.	-	-	90,000
Contingencies at 15 percent				1,879,700
Subtotal				14,411,000
TOTAL, LOCKS				111,789,000

TABLE 9-12 (cont'd)

DETAILED ESTIMATE OF CAPITAL COST
(MONTGOMERY TO GADSDEN)

Item	Unit	Quantity	Unit price	Amount
3. CHANNELS				
Lock approaches:				
Walter Bouldin lock				
Clearing	Acre	20	$400.00	$ 8,000
Excavation, common	C.Y.	1,263,200	0.75	947,400
Excavation, rock	C.Y.	576,000	1.75	1,008,000
Dumped rock	C.Y.	30,000	9.00	270,000
Bedding material	C.Y.	11,000	7.00	77,000
Contingencies at 15 percent				346,600
Subtotal				2,657,000
Mitchell lock				
Clearing	Acre	29	400.00	11,600
Excavation, common	C.Y.	29,300	0.75	22,000
Excavation rock	C.Y.	38,000	2.00	76,000
Contingencies at 15 percent				16,400
Subtotal				126,000
Lay lock				
Clearing	Acre	9	400.00	3,600
Excavation, common	C.Y.	1,900	0.75	1,400
Excavation, rock	C.Y.	22,700	2.00	45,400
Contingencies at 15 percent				7,600
Subtotal				58,000
Logan Martin lock				
Clearing	Acre	29	400.00	11,600
Excavation, common	C.Y.	164,200	0.75	123,200
Excavation, rock	C.Y.	1,300	2.00	2,600
Dumped rock	C.Y.	4,930	9.00	44,400
Bedding material	C.Y.	1,850	7.00	13,000
Contingencies at 15 percent				29,200
Subtotal				224,000

TABLE 9-12 (cont'd)

DETAILED ESTIMATE OF CAPITAL COST
(MONTGOMERY TO GADSDEN)

Item	Unit	Quantity	Unit price	Amount
Lock approaches (cont'd)				
H. Neely Henry lock				
Clearing	Acre	30	$ 400.00	$ 12,000
Excavation, common	C.Y.	160,600	0.75	120,500
Excavation, rock	C.Y.	64,300	2.00	128,600
Dumped rock	C.Y.	5,900	9.00	53,100
Bedding material	C.Y.	2,200	7.00	15,400
Contingencies at 15 percent				49,400
Subtotal				379,000
Total, Lock Approaches				3,444,000
Reservoir:				
Mitchell				
Excavation, unclassified	C.Y.	290,000	2.50	725,000
Contingencies at 15 percent				109,000
Subtotal				834,000
Lay				
Excavation, unclassified	C.Y	67,000	2.50	167,500
Contingencies at 15 percent				25,500
Subtotal				193,000
Logan Martin				
Dredging	C.Y.	372,000	0.70	260,400
Excavation, unclassified	C.Y.	223,000	2.50	557,500
Excavation, rock	C.Y.	149,000	6.00	894,000
Contingencies at 15 percent				257,100
Subtotal				1,969,000
Total, Reservoir				2,996,000
TOTAL, CHANNELS				6,440,000

TABLE 9-12 (cont'd)

DETAILED ESTIMATE OF CAPITAL COST
(MONTGOMERY TO GADSDEN)

Item	Unit	Quantity	Unit price	Amount
TOTAL FEDERAL CONSTRUCTION COST				$143,231,000
Engineering and design				5,721,000
Supervision and administration				8,583,000
SUB-TOTAL FEDERAL CAPITAL COST				157,535,000
SUB-TOTAL FEDERAL CAPITAL COST ESCALATED TO JAN 69				168,405,000
Aids to navigation (U.S.C.G.)				65,000
TOTAL FEDERAL CAPITAL COST				157,600,000
TOTAL FEDERAL CAPITAL COST ESCALATED TO JANUARY 1969				168,470,000
NON-FEDERAL				
1. LANDS				
Lands (spoil areas)	Acre	31	$2,000.00	62,000
Lands for utility relocations	Acre	15	2,000.00	30,000
Contingencies				14,000
Acquisition				9,000
TOTAL LANDS				115,000
2. RELOCATIONS				
Railroad bridges:				
Southern (2)	L.S.	2	-	160,500
Central of Georgia	L.S.	1	-	58,200
Seaboard Coast Line	L.S.	1	-	94,400
Seaboard Coast Line	L.S.	1	-	140,900
Louisville and Nashville	L.S.	1	-	130,900
Highway bridges:				
U.S. Highways 231 & 280	L.S.	1	-	618,600
U.S. Highway 78	L.S.	1	-	659,700
U.S. Highway 431	L.S.	1	-	255,200
U.S. Highway 11 (Alt.)	L.S.	1	-	750,000
Alabama Highway 77	L.S.	1	-	614,500
Talladega County No. 70	L.S.	1	-	216,000
11th Street	L.S.	1	-	750,000
Randall Drive	L.S.	1	-	750,000

TABLE 9-12 (cont'd)

DETAILED ESTIMATE OF CAPITAL COST
(MONTGOMERY TO GADSDEN)

Item	Unit	Quantity	Unit price	Amount
2. RELOCATIONS (Cont'd)				
Utilities:				
Utilities	L.S.			$ 796,400
Contingencies				1,204,300
TOTAL RELOCATIONS				7,200,000
3. CHANNEL, BASIN AND WHARF				
Clearing and snagging	Acre	65	$400.00	26,000
Dredging, unclassified	C.Y.	689,000	1.75	1,205,800
Drop structure	Job			50,000
Sheet piling	S.F.	25,000	4.00	100,000
Concrete wharf	C.Y.	300	90.00	27,000
Dolphins	Each	16	750.00	12,000
Contingencies				355,000
TOTAL CHANNEL, BASIN AND WHARF				1,776,000
TOTAL NON-FEDERAL CONSTRUCTION COST				8,976,000
Engineering and design				1,043,000
Supervision and administration				766,000
TOTAL NON-FEDERAL CAPITAL COST				10,900,000
TOTAL NON-FEDERAL CAPITAL COST ESCALATED TO JAN 69				11,341,000
TOTAL PROJECT CAPITAL COST				168,500,000
TOTAL PROJECT CAPITAL COST ESCALATED TO JAN 69				179,811,000

TABLE 9-13

DETAILED ESTIMATE OF ANNUAL COSTS
(MONTGOMERY TO GADSDEN)
(January 1969 prices)

Item		Financial	Economic [1]
Federal investment			
(1) Recapitulation of project costs			
(a) Project first cost		$168,470,000	$165,590,000
(2) Interest during construction at 3½% for ½ of construction period of 10 years		27,376,000	26,908,000
(3) Total gross and net investment		195,846,000	192,498,000
Annual Federal costs			
(1) Interest on gross investment (3½%)		6,364,000	6,256,000
(2) Amortization (50-year life)		1,612,000	1,584,000
(3) Maintenance and operation		484,000	484,000
(a) Locks	361,000		
(b) Channels	112,000		
(c) Aids to navigation (U.S.C.G.)	11,000		
(4) Major replacements		88,000	88,000
(5) Total Federal annual costs		8,548,000	8,412,000
Non-Federal investment			
(1) Recapitulation of project costs			
(a) Project first cost		11,341,000	10,300,000
(b) Market value of land-amount is inclusive in total (1)(a) above			92,000
(2) Interest during construction at 3½% for ½ of construction period of 2 years		369,000	335,000
(3) Total gross investment		11,710,000	10,635,000
(4) Net salvage value (.80 x 92,000)			74,000
(5) Total non-Federal net investment		11,710,000	10,561,000

[1] Reflects adjustment in cost of bridge construction to represent "replacement-in-kind" only.

TABLE 9-13 (cont'd)

DETAILED ESTIMATE OF ANNUAL COSTS
(MONTGOMERY TO GADSDEN)

Item		Financial	Economic
Annual non-Federal costs			
(1) Interest on gross investment (3¼%)		$ 381,000	$ 346,000
(2) Adjustment for net loss of productivity of land		-	1,000
(3) Amortization on net investment (50-year life)		96,000	87,000
(4) Maintenance and operation		44,000	44,000
(a) Bridges	3,000		
(b) Channel	37,000		
(c) Wharf and drop structure	4,000		
(5) Total non-Federal annual costs		521,000	478,000
TOTAL PROJECT ANNUAL CHARGES		9,069,000	8,890,000

TABLE 9-14

DETAILED ESTIMATE OF CAPITAL COSTS
(GADSDEN TO ROME)

Item	Unit	Quantity	Unit price	Amount
FEDERAL				
1. **RELOCATIONS**				
Highway bridges:				
U. S. Highway No. 411	L.S.	1	-	1,087,200
Alabama Highway No. 9	L.S.	1	-	702,900
Georgia Highway No. 100	L.S.	1	-	1,265,200
Etowah County Road No. 30	L.S.	1	-	598,000
Utilities:				
Power and communication lines	L.S.	-	-	254,000
Pipeline, miscellaneous discharge and protective works	L.S.	-	-	270,000
Contingencies at 15 percent				626,700
TOTAL, RELOCATIONS				4,804,000
2. LOCK				
Cofferdam and pumping	L.S.	-	-	1,599,000
Clearing	Acre	23	$400.00	9,200
Excavation, common	C.Y.	446,800	0.75	335,100
Excavation, rock	C.Y.	470,900	2.00	941,800
Backfill, compacted	C.Y.	130,600	1.00	130,600
Removing and replacing dam structures	L.S.	-	-	219,100
Concrete	C.Y.	258,600	26.00	6,723,600
Drilling grout holes	L.F.	7,600	5.00	38,000
Grout	C.F.	3,800	9.50	36,100
Steel reinforcement	Tons	829	300.00	248,700
Miscellaneous metal	Tons	38	1,200.00	45,600

TABLE 9-14 (cont'd)

DETAILED ESTIMATE OF CAPITAL COSTS
(GADSDEN TO ROME)

Item	Unit	Quantity	Unit price	Amount
Wall armor	Tons	274	$ 800.00	$ 219,200
Parapet wall and railing	L.S.	-	-	150,000
Upper miter gate	Tons	282	1,200.00	338,400
Lower miter gate	Tons	482	1,200.00	578,400
Miter gate machinery	L.S.	-	-	140,000
Tainter valves	Each	4	47,250.00	189,000
Tainter valve machinery	L.S.	-	-	129,000
Stoplogs and pickup beam	L.S.	-	-	300,000
Hydraulic system	L.S.	-	-	120,000
Compressed air and water systems	L.S.	-	-	50,000
Culvert bulkheads	Each	4	15,000.00	60,000
Grating	L.S.	-	-	45,000
Floating mooring bitts, complete	L.S.	-	-	62,000
Electrical system	L.S.	-	-	250,000
Control station and operation booths	L.S.	-	-	90,000
Contingencies at 15 percent				1,957,200
TOTAL, LOCK				15,005,000
3. CHANNELS				
Lock approaches:				
Clearing	Acre	15	400.00	6,000
Excavation, common	C.Y.	292,100	0.75	219,100
Excavation, rock	C.Y.	154,300	2.00	308,600
Dumped rock	C.Y.	9,800	9.00	88,200
Bedding material	C.Y.	3,700	7.00	25,900
Contingencies at 15 percent				97,200
Total, Lock approaches				745,000
Reservoir:				
H. Neely Henry				
Excavation, unclassified	C.Y.	43,000	2.50	107,500
Contingencies at 15 percent				16,500
Subtotal				124,000

TABLE 9-14 (cont'd)

DETAILED ESTIMATE OF CAPITAL COSTS
(GADSDEN TO ROME)

Item	Unit	Quantity	Unit price	Amount
Reservoir (cont'd)				
Weiss				
Dredging	C.Y.	266,000	$0.70	$ 186,200
Excavation, unclassified	C.Y.	23,000	2.50	57,500
Excavation, rock	C.Y.	435,000	6.00	2,610,000
Removal of Mayo's Bar Dam	L.S.	-	-	175,000
Contingencies at 15 percent				453,300
Subtotal				3,482,000
TOTAL, CHANNELS				4,351,000
TOTAL FEDERAL CONSTRUCTION COST				24,160,000
Engineering and design				1,348,000
Supervision and administration				1,592,000
SUBTOTAL FEDERAL CAPITAL COST				27,100,000
SUBTOTAL FEDERAL CAPITAL COST ESCALATED TO JAN 69				28,970,000
AIDS TO NAVIGATION (U.S.C.G.)				34,000
TOTAL FEDERAL CAPITAL COST				27,134,000
TOTAL FEDERAL CAPITAL COST ESCALATED TO JAN 69				29,004,000
NON-FEDERAL				
1. RELOCATIONS				
Highway bridges:				
Georgia Highway No. 100	L.S.	1	-	545,800
Utilities:				
Sill for Rome water intake	L.S.	1	-	193,000
Sewer outfall modifications	L.S.	1	-	79,000
Contingencies at 15 percent				122,200
TOTAL, RELOCATIONS				940,000
TOTAL NON-FEDERAL CONSTRUCTION COST				940,000

TABLE 9-14 (cont'd)

DETAILED ESTIMATE OF CAPITAL COSTS
(GADSDEN TO ROME)

Item	Unit	Quantity	Unit price	Amount
Engineering and design				$ 80,000
Supervision and administration				80,000
TOTAL NON-FEDERAL CAPITAL COST				1,100,000
TOTAL NON-FEDERAL CAPITAL COST ESCALATED TO JAN 69				1,150,000
TOTAL PROJECT CAPITAL COST				28,234,000
TOTAL PROJECT CAPITAL COST ESCALATED TO JAN 69				30,154,000

TABLE 9-15

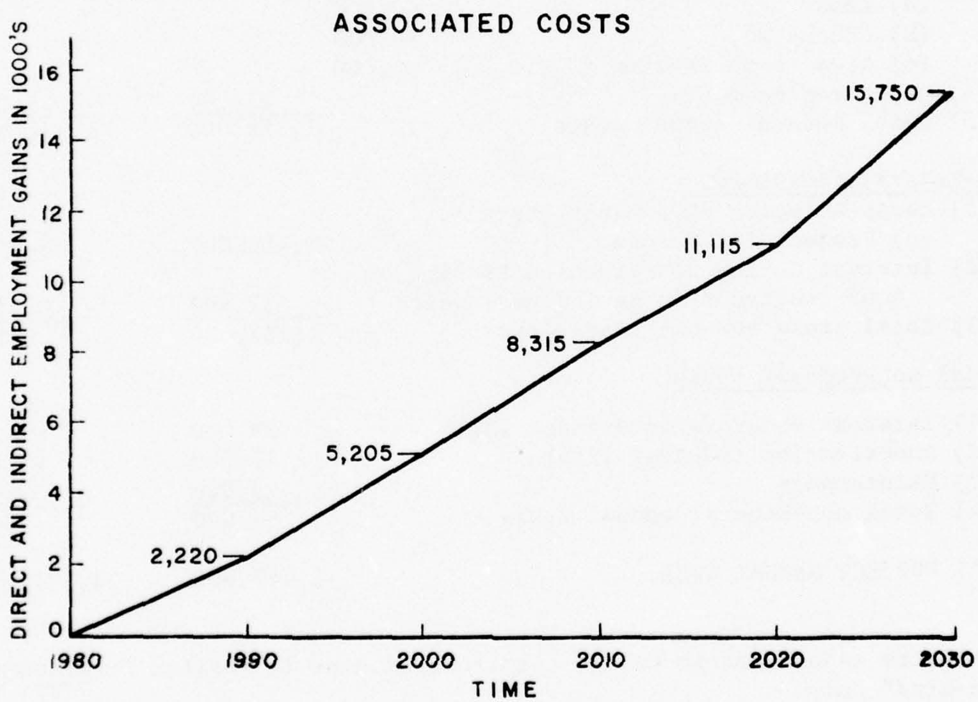
DETAILED ESTIMATE OF ANNUAL COSTS
(GADSDEN TO ROME)
(January 1969 prices)

Item		Financial	Economic [1]
Federal investment			
(1) Recapitulation of project costs			
(a) Project first cost		$29,004,000	$27,573,000
(2) Interest during construction at 3¼% for ½ of construction period of 4 years		1,885,000	1,792,000
(3) Total gross and net investment		30,889,000	29,365,000
Annual Federal costs			
(1) Interest on gross investment (3¼%)		1,004,000	954,000
(2) Amortization (50-year life)		254,000	242,000
(3) Maintenance and operation		122,000	122,000
(a) Locks	67,000		
(b) Channels	49,000		
(c) Aids to navigation (U.S.C.G.)	6,000		
(4) Major replacements		13,000	13,000
(5) Total Federal annual costs		1,393,000	1,331,000
Non-Federal investment			
(1) Recapitulation of project costs			
(a) Project first cost		1,150,000	904,000
(2) Interest during construction at 3¼% for ½ of construction period of 2 years		37,000	29,000
(3) Total gross and net investment		1,187,000	933,000
Annual non-Federal costs			
(1) Interest on gross investment (3¼%)		39,000	30,000
(2) Amortization (50-year life)		10,000	8,000
(3) Maintenance		5,000	5,000
(4) Total non-Federal annual costs		54,000	43,000
TOTAL PROJECT ANNUAL COST		1,447,000	1,374,000

[1] Reflects adjustment in bridge construction cost to reflect "replacement-in-kind" only.

13. DEVELOPMENTAL COSTS

The costs associated with providing the additional employment anticipated in the Coosa River area (See paragraph 21, section III) were considered to be relevant indicators for use in estimating the regional income to cost index of performance. An average cost of $32,800 per employee was utilized in estimating developmental costs, based on Corps of Engineers studies of the chemical and steel industry investment per employee ($53,500 and $49,600, respectively) and an average of $15,000 for other employment. Investment costs were discounted to present value utilizing the planning rate (3¼%) and amortized at an assumed long range private interest rate of 5 percent. Projected expenditures were assumed to be uniform during each year of 10-year intervals from 1980 through 2030. In estimating investments, it was assumed that buildings and fixed facilities would have 50-year life; equipment would have 25-year life. Present worth of investments was estimated at $264,536,000 and average annual equivalent value at $14,490,000.



$$\text{Avg. costs/Employee} = \frac{\$53{,}500\text{x}820 \ + \ \$49{,}600\text{x}7{,}175 \ + \ \$15{,}000\text{x}7{,}755}{15{,}750} = \$32{,}800$$

SECTION III - NAVIGATION AND RELATED BENEFITS

14. GENERAL PROCEDURE

This section describes basic data and procedures used to determine the immediate and long-range navigation benefits which could reasonably be expected to result from construction of the Coosa River Navigation Project. The benefits are expressed in terms of savings in transportation charges on prospective barge commerce to and from the area served by the waterway, increase in recreational boating activities induced by construction of locks in existing pools, thereby connecting the pools with the nation's inland waterway system, increased employment, due to project construction, in counties designated under Public Works and Economic Development Act of 1965 as economically depressed counties (economic redevelopment benefits), and enhancement of land values which would result from shifting of use from agricultural to industrial. Benefits to transportation, recreational boating, and land use were projected along applicable growth curves developed by the Office of Business Economics and Bureau of Outdoor Recreation over the expected life of the project and converted to average annual equivalent values by the appropriate discount rate.

Traffic available for transportation by barge on the authorized extension of the Alabama-Coosa system from Montgomery to Rome would consist primarily of that now moving by overland carriers plus some moving by barge-rail combination involving existing inland waterways. An extensive field canvass of shippers and receivers of freight, a study of available traffic statistics, and a traffic rate analysis were therefore necessary to determine the commodities and tonnages that could be transported over the Coosa River waterway at a savings in transportation charges.

Transportation savings on prospective waterway commerce were evaluated in accordance with the standards and criteria as provided in Section 7 (a) of the Department of Transportation Act of 1966 (Public Law 89-670), defined as follows:

> "The standards and criteria for economic evaluation of water resources projects shall be developed by Water Resources Council established by Public Law 89-80. For the purpose of such standards and criteria, the primary direct navigation benefits of a water resource project are defined as the product of the savings to shippers using the waterway, where the savings to shipper shall be construed to mean the difference between (a) the freight rates or charges prevailing at the time of the study for the movement by the alternative means, and (b) those which would be charged on the proposed waterway; and where the estimate of traffic that

would use the waterway will be based on such freight rates, taking into account projections of the economic growth of the area."

In selecting the alternative mode of transportation to be used in estimating savings to shippers, the estimated effects of the authorized Alabama River Waterway from Mobile to Montgomery, now under construction, were considered.

The basis for determining benefits to recreational boating is the concept that the value of such benefits bears a percentage relationship to the value of the boats used. Evaluation procedure is in accordance with the Engineering Manual for Civil Works (Series 1120-2-113). The value of the benefit was derived by determining the number of new boats, by classes, that would be based along the reach above Montgomery by reason of connection of the existing reservoirs with the inland waterway system, affording the opportunity for longer cruises by recreational craft.

Concepts employed in derivation of redevelopment benefits (formerly designated as "ARA" benefits) were adopted from Senate Document 97, Eighty-seventh Congress, 2d session, and ER 1165-2-6 dated 1 February 1966. The redevelopment benefits are limited to the evaluation of those benefits associated with the use of labor for project construction and operation that would otherwise be unemployed or underemployed in the absence of the project.

Land enhancement benefits relate to the use of areas at waterside, with rail and highway access, by industries which would be established as a result of induced traffic on the waterway. Estimated increase in land values by conversion from agricultural to industrial use was adjusted by subtracting developmental costs to derive the net increase.

Additional employment resulting from new industrial growth on the enhanced land provide the basis for computing developmental wage benefits.

15. TRIBUTARY AREA

Delineation. - The tributary area which would be served by the Coosa River Waterway is the contiguous area to or from which traffic could move via connecting waterways at a savings in transportation charges. The area embraces about 18,000 square miles comprising 20 counties in northeast Alabama and 14 counties in northwest Georgia, as shown on exhibit 9-4. This differs from the 36-county area considered in the impact study reported in Section IV of this chapter. Jefferson County, Alabama, and Hamilton County, Tennessee, were eliminated after the study.

Population. - Total population of the 34-county tributary area was 1,183,000 in 1960, representing a 5 percent increase over the 1950 population. Population by county for the years 1950 and 1960, and the respective land areas, are shown in table 9-16.

TABLE 9-16

POPULATION AND AREA, BY COUNTY, IN TRIBUTARY AREA

County	Population 1950	Population 1960	Area in square miles
ALABAMA			
Autauga	18,000	19,000	599
Bibb	18,000	14,000	625
Blount	29,000	25,000	640
Calhoun	79,000	96,000	610
Cherokee	18,000	16,000	600
Chilton	27,000	26,000	699
Clay	14,000	12,000	603
Cleburne	12,000	11,000	574
Coosa	12,000	11,000	648
DeKalb	45,000	41,000	778
Elmore	32,000	31,000	628
Etowah	94,000	97,000	555
Jackson	39,000	37,000	1,124
Marshall	45,000	48,000	571
Montgomery	139,000	169,000	790
Randolph	22,000	20,000	581
Shelby	30,000	32,000	800
St. Clair	27,000	25,000	641
Talledega	64,000	66,000	750
Tallapoosa	35,000	35,000	711
Total Ala. counties	799,000	831,000	13,527
GEORGIA			
Bartow	27,000	28,000	463
Catoosa	15,000	21,000	167
Chattooga	21,000	20,000	317
Cherokee	21,000	23,000	414
Dade	7,000	9,000	168
Floyd	63,000	69,000	514
Gordon	19,000	19,000	358
Haralson	14,000	15,000	285
Murray	11,000	11,000	342
Paulding	12,000	13,000	318
Pickens	9,000	9,000	225
Polk	31,000	28,000	312
Walker	38,000	45,000	445
Whitfield	35,000	42,000	281
Total Ga. counties	323,000	352,000	4,609
Total tributary Area	1,122,000	1,183,000	18,136

Natural Resources. - Mineral resources in the Coosa River Basin include iron ore, various types of clays, limestone, coal, mica, marble, barite, slate, sand, and gravel. Some amounts of limestone, sand, and gravel are quarried in practically all of the 34 counties. Minerals produced in the tributary area in 1964, by counties, are shown in table 9-17.

TABLE 9-17

MINERAL PRODUCTION IN THE TRIBUTARY AREA[1]

Minerals produced in 1964	Counties
Sand and gravel	Autauga, Cherokee, Chilton, Cleburne, Elmore, Etowah and Montgomery in Alabama; Cherokee in Georgia.
Limestone	Bibb, Blount, Calhoun, DeKalb, Etowah, Jackson, Marshall, Shelby, St. Clair and Talladega in Alabama; Bartow, Date, Floyd, Walker and Whitfield in Georgia.
Clays	Blount, Calhoun, Etowah, Montgomery, Shelby and St. Clair in Alabama; Floyd, Gordon and Polk in Georgia.
Coal	Blount, Etowah, Jackson, Shelby and St. Clair in Alabama; Walker in Georgia.
Mica	Randolph in Alabama; Cherokee in Georgia.
Iron Ore	Blount, Calhoun, Cherokee and Talladega in Alabama; Bartow and Polk in Georgia.

[1] U. S. Department of Interior, Minerals Yearbook 1964

About 67 percent of the land area in Alabama and 69 percent in Georgia is classed as forest or potential forest. Most timberland in Alabama is in small tracts. Statewide, commercial forest land in holdings of less than 5,000 acres aggregates nearly 14.7 million acres. Between 1953 and 1963, acreage in ownerships of 50,000 acres or more rose from 2.6 to 4.0 million. The increase in big holdings largely reflects expansion of industrially-owned lands. Commercial forest land in Alabama held by wood-using industries totaled about 4.1 million acres in 1963, or about 19 percent of the state's woodland acreage.

Loblolly and shortleaf pine, oak, hickory, and other mixture of hardwoods dominate most of the forestland within the area tributary to the Coosa River.

Agriculture. - According to the 1964 census of the Department of Agriculture, 874,000 acres of cropland were harvested that year in the tributary area. This represents only about 8 percent of the total land area. The cropland harvested in the States of Alabama and Georgia during the same year was 9 and 11 percent, respectively. The farm population in percent of total population in the tributary area declined from 34 percent in 1950 to 12 percent in 1960. Agriculture in the area consists largely of general farming, including production of row crops, poultry raising, and dairying. Corn, cotton, and small grains are among the leading row crops produced; however, soybeans are rapidly becoming the major cash crop in the tributary area.

Manufacturing. - The southeast has experienced substantial growth in manufacturing in recent years. According to the 1963 census of manufactures, industrial growth measured in terms of value added by manufacture increased 42 percent in Alabama and 55 percent in Georgia during the 5-year period 1958 to 1963. In the tributary area, the increase was 41 percent during the same period. Manufactured items produced in the tributary area include finished iron and steel articles, textile products, chemicals, automobile tires, paper and paper products, lumber and wood products, and stone and clay products. The largest single industry in terms of number of establishments is that engaged in the manufacture of lumber and wood products.

Transportation Facilities. -

a. Railroads - Four major railroads serve the tributary area and provide adequate rail service between this area and points throughout the country. The lines include the Southern Railway, Seaboard Coast Line, Louisville and Nashville, and the Central of Georgia. The main rail centers in the tributary area are Anniston, Gadsden, Attalla, and Talladega, Alabama, and Rome, Georgia.

b. Highways - Truck transport service between points in the area and others throughout the nation is made possible by a network of Federal, state and secondary highways. Federal Interstate Highway 65 serves the north-south direction, interconnecting with I-20 (east-west) and I-59 (northeast-southwest) at Birmingham, and with I-85 (northeasterly) at Montgomery. Numerous other Federal, state and county roads complete the system and provide service to practically all points in the area.

c. Connecting Waterways - The Coosa River Waterway would be connected via the Alabama River Waterway, now under construction, to the navigable Black Warrior-Tombigbee River system which extends northward into the Birmingham-Jasper area and also joins the authorized waterway connecting the Tombigbee and Tennessee Rivers. Southward, the system connects with the deep-water port of Mobile and the Gulf Intracoastal Waterway. The latter serves all points along the Gulf coast from Brownsville, Texas, to St. Marks, Florida, and connects with the Mississippi River and other navigable waterways tributary to the Gulf.

d. Pipelines - Three trunk pipelines for petroleum products, with feeder lines and outlets, serve the tributary area. Two of these, the Colonial and Plantation Pipelines, carry refined oils. The third, the Dixie Pipeline, transports liquefied petroleum gases.

16. BASE YEAR COMMERCE AND SAVINGS

Traffic Survey. - Estimates of prospective commerce are based on interviews and correspondence with shippers and receivers of freight in the tributary area supplemented by examination of available statistics applicable to existing waterways and ports, and by statistical means for certain commodities. The survey was conducted in 1967 and officials of some 600 firms were contacted to obtain their 1966 traffic pattern and other items pertinent to a determination of availability of traffic for a barge channel from Montgomery to Rome. Follow-up contacts were made in 1969 with several of the major shippers by members of the staff of the Chief of Engineers, and other Corps of Engineers members. The traffic pattern for iron and steel products produced in the tributary area was determined by statistical means by contract with a research consultant.

The information collected was entered on standard questionnaire forms approved by the Bureau of the Budget (No. 49-R-363.2). The survey resulted in reported movements of commodities in the tributary area amounting to 43,905,000 tons of which 2,190,000 tons were determined to be barge adaptable, warranting further screening and analysis. This traffic is listed in table 9-18 by commodity groups. A selective process was used for determining firms to be solicited for information on traffic since the majority of the firms listed in the various directories obviously could not use waterway transportation or would only duplicate data obtained from other sources. Also, a number of firms declined to furnish information or sufficient detailed data to permit a point-to-point rate analysis. Accordingly, the information obtained represents somewhat less than the full amount of potential waterway traffic. It is therefore estimated that the reported totals amount to a 90 percent sample. Consequently the finally accepted prospective commerce has been increased by 10% to account for the sampling deficiency.

TABLE 9-18

SUMMARY OF ANNUAL COMMERCE DEVELOPED BY SURVEY TO BE FURTHER SUBJECTED TO SCREENING AND RATE ANALYSIS

Commodity or commodity group	Annual tonnage Upbound	Downbound	Total
Forest products	18,000	-	18,000
Metallic ores	400,000	-	400,000
Non-metallic minerals, except fuels	445,000	199,000	644,000
Food and kindred products	47,000	-	47,000
Basic textiles	110,000	-	110,000
Lumber and wood products, except furniture	33,000	-	33,000
Pulp, paper and allied products	18,000	174,000	192,000
Chemicals and allied products	229,000	90,000	319,000
Petroleum and coal products	175,000	-	175,000
Primary metal products	18,000	223,000	241,000
Fabricated metal products, except ordnance, machinery, and transportation equipment	9,000	-	9,000
Waste and scrap materials	-	2,000	2,000
Total	1,502,000	688,000	2,190,000

Commerce analyzed . - The 1966 commerce (2,190,000 tons) was further screened to eliminate those movements which obviously could not move due to the nature of the commodity, excessive circuity of routing, small lot shipments, special handling requirements, duplication of information, and other incidental reasons such as captive tonnages moving under transit rates. The screening process reduced the commerce to be subjected to rate analysis to 2,112,000 tons. A list, by commodity, of traffic subjected to detailed freight rate analysis is given in table 9-19.

Methods Used in Determining Savings. - As stated heretofore, savings reflect the difference between present and prospective transportation charges on commodity movements which, after screening of shipping data collected during the survey, are considered adaptable to barge transportation via the Coosa River Waterway. This potential waterway traffic was then subjected to an analysis of applicable rates and charges to determine the current transportation charges via existing routes. These were then compared with estimated rates and charges for shipments via the considered Coosa River route. The difference represents the benefits creditable to the Coosa. However, when the haul could alternatively move via the Alabama River to Montgomery (now under construction and scheduled for completion in 1971) and overland to or from the tributary area at less cost than via present means, the estimated saving via the Coosa River was adjusted to recognize the advantage of the route under construction. Induced traffic and savings, described later, were also evaluated and added to the benefits. All rates and charges used in the analysis are based on those in effect in January 1969 so as to assure that unit savings and project costs will be on the same time basis.

a. Barge Transportation Charges - Barge rates published in tariffs on file with the Interstate Commerce Commission were used, where possible, in determining waterway charges applicable via the waterway route involved. In some cases charges were based on rates quoted by contract carriers. Where necessary, charges were constructed on the basis of published or quoted rates for comparable movements on similar waterways.

b. Overland Transportation Charges - Where prospective waterway traffic now moves all-rail, all-truck, or by pipeline, between origin and destination, applicable published rates from tariffs on file with the Interstate Commerce Commission or other regulatory agency were used in the rate analyses for determining existing charges. In most cases, these same sources were used in determining prospective overland charges to or from proposed waterway ports. Where specific point-to-point published rates were not available, published scale rates were used, with consideration given to volume, minimum loads, distances, and other governing factors.

TABLE 9-19

COMMERCE SUBJECTED TO RATE ANALYSIS[1]

Commodity	Annual tonnage Upbound	Downbound	Total
Forest products			
Rubber, crude	18,000	-	18,000
Sub-total	18,000	-	18,000
Metallic ores			
Ore, iron (import)	400,000	-	400,000
Sub-total	400,000	-	400,000
Non-metallic minerals			
Barite	-	35,000	35,000
Clay, fire	-	36,000	36,000
Marble, crushed	-	126,000	126,000
Salt	100,000	-	100,000
Sand and gravel	316,000	-	316,000
Silica, fused	-	2,000	2,000
Sulphur, liquid	28,000	-	28,000
Sub-total	444,000	199,000	643,000
Food and kindred products			
Cottonseed meal	3,000	-	3,000
Fish meal	13,000	-	13,000
Molasses, blackstrap	30,000	-	30,000
Sub-total	46,000	-	46,000
Basic textiles			
Jute	110,000	-	110,000
Sub-total	110,000	-	110,000
Lumber and wood products			
Lumber	2,000	-	2,000
Pulpwood	31,000	-	31,000
Sub-total	33,000	-	33,000

[1] Note: Tonnages are rounded to the nearest 1,000.

TABLE 9-19 (cont'd)

COMMERCE SUBJECTED TO RATE ANALYSIS

Commodity	Annual tonnage Upbound	Downbound	Total
Pulp, paper, and allied products			
Newsprint paper	-	68,000	68,000
Paperboard	-	20,000	20,000
Pulpboard (export)	-	68,000	68,000
Woodpulp	17,000	-	17,000
Sub-total	17,000	156,000	173,000
Chemicals and allied products			
Acid, sulphuric	11,000	14,000	25,000
Benzene	37,000	-	37,000
Carbon disulphide, liquid	10,000	-	10,000
Caustic potash, liquid	-	9,000	9,000
Caustic soda, liquid	39,000	-	39,000
Chlorine, gas	13,000	-	13,000
Fertilizer, dry	9,000	-	9,000
Methanol	4,000	-	4,000
Parathion, liquid	-	4,000	4,000
Phosphate feed supplements	2,000	-	2,000
Rubber, synthetic	73,000	-	73,000
Soda ash	3,000	-	3,000
Sodium chloride	18,000	-	18,000
Tall oil	-	5,000	5,000
Turpentine	-	14,000	14,000
Urea solution	8,000	-	8,000
Sub-total	227,000	46,000	273,000
Petroleum and coal products			
Asphalt	20,000	-	20,000
Coke, petroleum	5,000	-	5,000
Refined petroleum products	150,000	-	150,000
Sub-total	175,000	-	175,000

TABLE 9-19 (cont'd)

COMMERCE SUBJECTED TO RATE ANALYSIS

Commodity	Annual tonnage Upbound	Annual tonnage Downbound	Total
Primary metal products			
Iron and steel products	6,000	211,000	217,000
Pipe, cast iron	-	12,000	12,000
Steel plates	10,000	-	10,000
Steel tubing	2,000	-	2,000
Sub-total	18,000	223,000	241,000
TOTAL	1,488,000	624,000	2,112,000

c. Terminal, Transfer, and Switching Charges - Accessorial charges, including handling and switching, were added to all shipments expected to move via the proposed waterway, where transportation other than port-to-port movement was involved. The charges used were based on information contained in published tariffs, or information furnished by shippers interviewed during the traffic survey.

Induced effects. - The induced effects were considered in three parts.

a. Part A of the induced traffic includes movements of sulphur liquid and sulphuric acid. The plant associated with these commodities is located at waterside and is now used to supplement production from another plant. Company officials advise that the waterside plant would be used on a full-time basis with an improved waterway. Base year traffic and unit savings are as follows:

Induced traffic	1966 tonnage	Present unit savings	Waterside unit savings	Total savings (1966)
Sulphur, liquid (upbound)	21,600	-	$4.38	$94,600
Sulphuric acid (upbound)	10,800	-	1.78	19,200
Sulphuric acid (downbound)	14,000	-	2.03	28,400
	46,400			142,200

b. Part B of the induced traffic includes movements of benzene, methanol, caustic potash liquid, parathion liquid, and pipe and fittings. These movements will be associated with plants which plan to relocate on the potential water-oriented industrial sites available with the proposed navigation improvement. Further information on water-oriented industrial sites is contained in Section IV herein entitled "Economic Impact." (See page 22 of report prepared by Southern Research Institute). Base year tonnage and unit savings data by commodity are tabulated below:

Commodity	1966 tonnage	Present unit savings	Waterside unit savings	Net unit savings
Benzene (upbound)	36,500	$0.49	$3.44	$2.95
Methanol (upbound)	3,600	1.90	4.85	2.95
Caustic potash (downbound)	9,000	0.73	4.72	3.99
Parathion, liquid (downbound)	4,000	1.93	6.03	4.10
Pipe and fittings (downbound)	12,400	-	3.30	3.30

The methodology followed for computing induced savings consists of using 75% of the difference between the projected tonnage after 1980 and the 1980 tonnage. Induced savings equals 75% of the incremental tons after 1980 multiplied by the net unit savings derived above.

c. The induced effects recognized in subparagraphs a and b above, are based on field survey of plants now on waterway in the area and those plants within the tributary area which could advantageously relocate on the improved waterway when suitable industrial waterway sites are provided. However, Part C of the induced effects recognizes those industries which are not now located within the tributary area (and therefore not surveyed) but would find it advantageous to select the waterside industrial locations which will be provided with navigation improvement. The benefits from Part C have not been quantified since they more appropriately would be classed under the developmental category.

Estimated Base-Year Savings. - The total accepted 1966 commerce and savings are detailed in table 9-20 for a waterway terminating at Gadsden and table 9-21 for a waterway terminating at Rome. The commerce, itemized by commodity, has been aggregated by commodity class and direction of movement. Summary of base-year traffic and savings and induced traffic and savings is given in table 9-22.

TABLE 9-20

PROSPECTIVE TONNAGES AND SAVINGS ON BASE-YEAR (1966) TRAFFIC
(WITH IMPROVEMENT TO GADSDEN, ALABAMA)

Commodity	Base-year commerce[1]		
	Tons	Average savings: Per ton	Average savings: Total
UPBOUND			
Forest products			
Rubber, crude	17,600	$0.97	$17,100
Sub-total	17,600		17,100
Metallic ores			
Ore, iron (import)	400,000	0.62	248,000
Sub-total	400,000		248,000
Non-metallic minerals			
Sulphur, liquid[2]	-	-	-
Sub-total	-		-
Food and kindred products			
Molasses, blackstrap	22,600	1.19	26,900
Sub-total	22,600		26,900
Pulp, paper and allied products			
Woodpulp	8,300	1.62	13,400
Sub-total	8,300		13,400
Chemicals and allied products			
Acid, sulphuric[2]	-	-	-
Benzene	36,500	0.49	17,900
Carbon disulphide, liquid	10,000	4.32	43,200
Caustic soda, liquid	38,000	3.42	130,000
Chlorine gas	13,000	6.91	89,800
Methanol	3,600	1.89	6,800
Urea solution	8,000	1.68	13,400
Sub-total	109,100		301,100

TABLE 9-20 (cont'd)

PROSPECTIVE TONNAGES AND SAVINGS ON BASE-YEAR (1966) TRAFFIC
(WITH IMPROVEMENT TO GADSDEN, ALABAMA)

Commodity	Base-year commerce[1]		
		Average savings	
	Tons	Per ton	Total
Petroleum products			
Asphalt	11,900	$1.62	$19,300
Gasoline	132,000	1.03	135,400
Fuel oil	8,400	2.75	23,100
Sub-total	152,300		177,800
Other upbound commerce	71,000	-	78,400
TOTAL UPBOUND	780,900	-	862,700
DOWNBOUND			
Pulp, paper and allied products			
Newsprint	32,000	2.15	68,700
Sub-total	32,000		68,700
Chemicals and allied products			
Acid, sulphuric[2]	-	-	-
Caustic potash, liquid	9,000	0.73	6,600
Parathion, liquid	4,000	1.93	7,700
Turpentine	5,800	4.33	25,100
Sub-total	18,800		39,400
Primary metal products			
Iron and steel products	164,000	2.35	385,000
Pipe, cast iron[2]	-		-
Sub-total	164,000		385,000
Other downbound commerce	21,500		49,300
TOTAL DOWNBOUND	236,300		542,300
TOTAL UPBOUND AND DOWNBOUND	1,017,200		1,405,100

1 Tons and savings rounded to thousands.
2 Accepted as induced traffic only; analyzed separately.

TABLE 9-21

PROSPECTIVE TONNAGES AND SAVINGS ON BASE-YEAR (1966) TRAFFIC
(WITH IMPROVEMENT TO ROME, GEORGIA)

Commodity	Base-year commerce[1]		
	Tons	Average savings: Per ton	Average savings: Total
UPBOUND			
Forest products			
Rubber, crude	17,600	$0.97	$17,100
Sub-total	17,600		17,100
Metallic ores			
Ore, iron (import)	400,000	0.62	248,000
Sub-total	400,000		248,000
Non-metallic minerals			
Sand and gravel	150,000	0.46	69,000
Sulphur, liquid[2]	-	-	-
Sub-total	150,000		69,000
Food and kindred products			
Molasses, blackstrap	22,600	1.45	32,700
Sub-total	22,600		32,700
Pulp, paper and allied products			
Woodpulp	8,300	1.62	13,400
Sub-total	8,300		13,400
Chemicals and allied products			
Acid, sulphuric[2]	-	-	-
Benzene	36,500	0.49	17,900
Carbon disulphide, liquid	10,000	4.32	43,200
Caustic soda, liquid	38,000	3.42	130,000
Chlorine gas	13,000	6.91	89,800
Methanol	3,600	1.90	6,800
Urea solution	8,000	1.67	13,400
Sub-total	109,100		301,100

TABLE 9-21 (cont'd)

PROSPECTIVE TONNAGES AND SAVINGS ON BASE-YEAR (1966) TRAFFIC
(WITH IMPROVEMENT TO ROME, GEORGIA)

Commodity	Base year commerce[1]		
		Savings	
	Tons	Per ton	Total
Petroleum products			
Asphalt	11,900	1.62	$19,300
Gasoline	132,000	1.41	186,700
Fuel oil	8,400	3.99	33,500
Sub-total	152,300		239,500
Other upbound commerce	86,000		92,100
TOTAL UPBOUND	945,900		1,012,900
DOWNBOUND			
Pulp, paper and allied products			
Newsprint	32,000	2.15	68,700
Sub-total	32,000		68,700
Chemicals and allied products			
Acid, sulphuric[2]	-	-	-
Caustic potash, liquid	9,000	0.73	6,600
Parathion, liquid	4,000	1.93	7,700
Tall oil	5,000	2.20	11,000
Turpentine	5,800	6.09	35,300
Sub-total	23,800		60,600
Primary metal products			
Iron and steel products	164,000	2.35	385,400
Sub-total	164,000		385,400
Other downbound commerce	22,000	-	51,500
TOTAL DOWNBOUND	241,800	-	566,200
TOTAL UPBOUND AND DOWNBOUND	1,187,700		1,579,100

1 Tons and savings rounded to thousands.
2 Accepted as induced traffic only; analyzed separately

TABLE 9-22

SUMMARY OF BASE-YEAR TRANSPORTATION BENEFITS (1966)

Item	Montgomery to Gadsden	Gadsden to Rome	Montgomery to Rome
a. Base Year Traffic (Tons)	1,017,200	170,500	1,187,700
b. Induced Traffic (Tons)	46,400	-	46,400
c. Total (Tons)	1,063,600	170,500	1,234,100
d. Savings to Shippers	$1,405,100	$174,000	$1,579,100
e. Savings on Induced Traffic	142,200	-	142,200
f. Total Savings	1,547,300	174,400	1,721,300

17. PROSPECTIVE COMMERCE AND SAVINGS OVER LIFE OF PROJECT

Economic Growth Indicators. - Economic growth or changes, both locally within the tributary area and nationally, are expected to be reflected in corresponding increases or changes in the annual volume of commerce available for movement via the proposed waterway. An estimate of the future volume movement of a specific commodity can be obtained by relating it to the projected future activity of a recognized economic indicator for the sector of the area's economy most nearly associated with the major use or demand for that commodity. Therefore, the prospective waterborne commerce was related to the relevant projection series to determine its normal growth (without the project) over the expected economic life of the project.

Economic growth indicators were first developed by the Southern Research Institute, Birmingham, Alabama, under contract with the Corps of Engineers. The report is on file in the Mobile District, Corps of Engineers. Later, studies were made by the Office of Business Economics (OBE) and economic projections published in "Preliminary Report on Economic Projections for Selected Areas, 1929-2020, Volume I." The projection series used for the Coosa River study are based on those developed in the OBE report, extrapolated to year 2030, estimated final year of project economic life. However, the relation of a specific commodity movement to a particular growth series was on the basis of recommendations by the Southern Research Institute.

Deviations from the above methods were made in the case of iron ore and iron and steel products on the basis of interviews with industry representatives and input-output relationships developed by the staff of the Chief of Engineers. Information furnished by industry representatives indicated that imported ore would increase from 400,000 tons in 1966 to 628,000 tons in 1975 (40% of the total requirements in that year), then at a rate of 5% per annum to 1980. Thereafter the series used was Primary Metals, G.P.O., for the tributary area (Code P). For iron and steel products it was agreed, based on industry reports, that 200,000 tons should be accepted for 1975 and the tonnage projected beyond that year on the basis of the input-output relationship developed by the Chief's staff; that is, at the same rate as iron ore. Projections of iron ore and iron and steel products are tabulated below:

Year	Iron ore (tons)	Factor	Average Annual Percent Change	Iron and Steel Products[1] (tons)	Factor
1966	400,000	1.000		164,000	0.820
			5.14		
1975	628,000	1.5700		200,000	1.000
			5.00		
1980	801,500	2.0038		255,100	1.275
			4.00		
1990	1,186,200	2.9655		377,600	1.888
			3.00		
2000	1,594,100	3.9852		507,500	2.537
			2.29		
2010	1,999,000	4.9975		636,400	3.182
			2.10		
2020	2,461,000	6.1525		783,600	3.918
			2.00		
2030	3,000,000	7.5000		955,200	4.776

[1] Iron & steel products projected at same growth rate as iron ore after 1975.

Factors used to project tonnages and savings, based on OBE data, coded by indicator, are listed in table 9-23. Tables 9-24 through 9-40 contain supporting data for each coded indicator based on the OBE report cited heretofore. Tonnages and savings for selected years are shown by commodity in tables 9-41 through 9-44

TABLE 9-23

FACTORS USED IN PROJECTING TONNAGES AND SAVINGS
(Based on OBE Projection Data)

Indicator	1966	1980	1990	2000	2010	2020	2030	Code
Population (National)	1.000	1.195	1.377	1.566	1.781	2.029	2.312	A
Construction GPO [1] (National)	1.000	1.808	2.605	3.873	5.709	8.399	12.356	B
Manufacturing GPO (National)	1.000	1.730	2.411	3.534	5.168	7.534	10.982	C
Paper GPO (National)	1.000	1.764	2.489	3.541	4.984	6.986	9.792	D
Chemicals GPO (National)	1.000	2.357	4.098	8.055	13.486	21.011	32.735	E
Petroleum GPO (National)	1.000	1.998	3.072	4.964	7.562	11.179	16.526	F
Primary Met. GPO (National)	1.000	1.640	2.163	2.849	3.771	5.099	6.894	G
Trans. Comm. & Util. GPO (National)	1.000	1.547	2.018	2.839	3.988	5.637	7.968	H
Personal Income (Southeast)	1.000	2.023	3.134	4.959	7.685	11.793	18.096	I
Agricul. GPO (Southeast)	1.000	1.323	1.509	1.840	2.219	2.804	3.543	J
Population (Tributary Area)	1.000	1.231	1.437	1.654	1.676	2.195	2.875	K
Agricul. GPO (Tributary Area)	1.000	1.293	1.416	1.650	1.923	2.310	2.774	L
Const. GPO (Tributary Area)	1.000	2.027	3.122	4.948	7.678	11.847	18.280	M
Paper GPO (Tributary Area)	1.000	2.052	3.049	4.438	6.249	8.984	12.915	N
Chemical GPO (Tributary Area)	1.000	2.595	4.678	9.624	16.568	26.415	42.116	O
Prim. Met. GPO (Tributary Area)	1.000	1.661	2.143	2.793	3.675	4.919	6.585	P
Textiles GPO (Tributary Area)	1.000	1.941	2.831	4.105	5.846	8.267	11.691	Q

1 GPO - Gross Product Originating

TABLE 9-24

PROJECTION OF ECONOMIC INDICATORS
POPULATION - NATIONAL (CODE A)

Year	Total Resident Population	Factor
1966	195,923,000 (1)	1.000
1980	234,193,000 (2)	1.195
1990	269,746,000 (2)	1.377
2000	306,757,000 (2)	1.566
2010	348,894,000 (2)	1.781
2020	397,562,000 (2)	2.029
2030	453,018,800 (3)	2.312

(1) Source: Population Estimates, Series P-25, No. 421, Bureau of Census.
(2) Source: PRELIMINARY REPORT ON ECONOMIC PROJECTIONS FOR SELECTED GEOGRAPHIC AREAS, 1929 to 2020, Volume I, prepared for Water Resources Council by U.S. Department of Commerce, Office of Business Economics, 1968.
(3) Extrapolated.

TABLE 9-25

PROJECTION OF ECONOMIC INDICATORS
CONSTRUCTION GPO - NATIONAL (CODE B)

Year	Value in thousands of 1958 $	Factor
1966	24,622,800 (1)	1.000
1980	44,512,000 (2)	1.808
1990	64,150,000 (2)	2.605
2000	95,378,000 (2)	3.873
2010	140,578,000 (2)	5.709
2020	206,818,000 (2)	8.399
2030	304,250,000 (3)	12.356

(1) Source: Interpolated from 1962-1970 total earnings data from PRELIMINARY REPORT ON ECONOMIC PROJECTIONS FOR SELECTED GEOGRAPHIC AREAS, 1920-2020, Volume I, prepared for Water Resources Council by U. S. Department of Commerce, Office of Business Economics, 1968.
(2) Based on total earnings in construction, source - Ibid.
(3) Extrapolated.

TABLE 9-26

PROJECTION OF ECONOMIC INDICATORS
MANUFACTURING GPO - NATIONAL (CODE C)

Year	Value in thousands of 1958 $	Factor
1966	121,033,700 (1)	1.000
1980	209,425,000 (2)	1.730
1990	291,884,000 (2)	2.411
2000	427,784,000 (2)	3.534
2010	625,524,000 (2)	5.168
2020	911,829,000 (2)	7.534
2030	1,329,173,000 (3)	10.982

(1) Source: Interpolated from 1962-1970 total earnings data from PRELIMINARY REPORT ON ECONOMIC PROJECTIONS FOR SELECTED GEOGRAPHIC AREAS, 1929-2020, Volume I, prepared for Water Resources Coundil by U. S. Department of Commerce, Office of Business Economics, 1968.

(2) Based on total earnings in manufacturing, source - Ibid.

(3) Extrapolated.

TABLE 9-27

PROJECTION OF ECONOMIC INDICATORS
PAPER GPO - NATIONAL (CODE D)

Year	Value in thousands of 1958 $	Factor
1966	7,072,700 (1)	1.000
1980	12,478,600 (2)	1.764
1990	17,604,800 (2)	2.489
2000	25,043,200 (2)	3.541
2010	35,251,900 (2)	4.984
2020	49,412,800 (2)	6.986
2030	69,255,900 (3)	9.792

(1) Source: Interpolated from 1962-1970 total paper GPO data from PRELIMINARY REPORT ON ECONOMIC PROJECTIONS FOR SELECTED GEOGRAPHIC AREAS, 1929-2020, Volume I, prepared for Water Resources Council by U. S. Department of Commerce, Office of Business Economics, 1968.

(2) Source: Ibid.

(3) Extrapolated.

TABLE 9-28

PROJECTION OF ECONOMIC INDICATORS
CHEMICALS GPO-NATIONAL (CODE E)

Year	Value in thousands of 1958 $	Factor
1966	16,222,800 (1)	1.000
1980	38,231,500 (2)	2.357
1990	66,475,700 (2)	4.098
2000	130,675,700 (2)	8.055
2010	218,790,300 (2)	13.486
2020	340,861,300 (2)	21.011
2030	531,053,400 (3)	32.735

(1) Source: Interpolated from 1962-1970 total Chemical GPO data from PRELIMINARY REPORT ON ECONOMIC PROJECTIONS FOR SELECTED GEOGRAPHIC AREAS, 1929-2020, Volume I, prepared by Water Resources Council by U. S. Department of Commerce, Office of Business Economics, 1968.
(2) Source: Ibid.
(3) Extrapolated.

TABLE 9-29

PROJECTION OF ECONOMIC INDICATORS
PETROLEUM GPO - NATIONAL (CODE F)

Year	Value in thousands of 1958 $	Factor
1966	4,853,600 (1)	1.000
1980	9,697,000 (2)	1.998
1990	14,909,000 (2)	3.072
2000	24,094,000 (2)	4.964
2010	36,701,000 (2)	7.562
2020	54,258,000 (2)	11.179
2030	80,210,600 (3)	16.526

(1) Source: Interpolated from 1961-1970 total petroleum GPO data from PRELIMINARY REPORT ON ECONOMIC PROJECTIONS FOR SELECTED GEOGRAPHIC AREAS, 1929-2020, Volume I, prepared for Water Resources Council by U. S. Department of Commerce, Office of Business Economics, 1968.
(2) Source: Ibid.
(3) Extrapolated.

TABLE 9-30

PROJECTION OF ECONOMIC INDICATORS
PRIMARY METALS GPO - NATIONAL (CODE G)

Year	Value in thousands of 1958 $	Factor
1966	15,602,200 (1)	1.000
1980	25,590,300 (2)	1.640
1990	33,742,200 (2)	2.163
2000	44,449,600 (2)	2.849
2010	58,829,400 (2)	3.771
2020	79,549,800 (2)	5.099
2030	107,561,600 (3)	6.894

(1) Source: Interpolated from 1962-1970 total primary metal GPO data from PRELIMINARY REPORT ON ECONOMIC PROJECTIONS FOR SELECTED GEOGRAPHIC AREAS, 1929-2020, Volume I, prepared for Water Resources Council by U. S. Department of Commerce, Office of Business Economics, 1968.
(2) Source: Ibid.
(3) Extrapolated.

TABLE 9-31

PROJECTION OF ECONOMIC INDICATORS
TRANSPORTATION, COMMUNICATION & UTILITIES
GPO - NATIONAL (CODE H)

Year	Value in thousands of 1958 $	Factor
1966	29,062,400 (1)	1.000
1980	44,969,000 (2)	1.547
1990	58,641,000 (2)	2.018
2000	82,496,000 (2)	2.839
2010	115,913,000 (2)	3.988
2020	163,835,000 (2)	5.637
2030	231,569,300 (3)	7.968

(1) Source: Interpolated from 1962-1970 total earnings data from PRELIMINARY REPORT ON ECONOMIC PROJECTIONS FOR SELECTED GEOGRAPHIC AREAS, 1929-2020, Volume I, prepared for Water Resources Council by U. S. Department of Commerce, Office of Business Economics, 1968.
(2) Based on total earnings in transportation communications and utilities sector, Source: Ibid.
(3) Extrapolated.

TABLE 9-32

PROJECTION OF ECONOMIC INDICATORS
TOTAL PERSONAL INCOME - SOUTHEAST (CODE I)

Year	Value in thousands of 1958 $	Factor
1966	95,023,600 (1)	1.000
1980	192,194,900 (2)	2.023
1990	297,853,000 (2)	3.134
2000	471,228,100 (2)	4.959
2010	730,294,700 (2)	7.685
2020	1,120,652,600 (2)	11.793
2030	1,719,547,100 (3)	18.096

(1) Source: Interpolated from 1962-1970 total personal income data from PRELIMINARY REPORT ON ECONOMIC PROJECTS FOR SELECTED GEOGRAPHIC AREAS, 1929-2020, Volume I, prepared for Water Resources Council by U. S. Department of Commerce, Office of Business Economics, 1968.
(2) Source: Ibid.
(3) Extrapolated.

TABLE 9-33

PROJECTION OF ECONOMIC INDICATORS
AGRICULTURAL GPO - SOUTHEAST (CODE J)

Year	Value in thousands of 1958 $	Factor
1966	4,411,100 (1)	1.000
1980	5,837,600 (2)	1.323
1990	6,657,000 (2)	1.509
2000	8,114,800 (2)	1.840
2010	9,787,400 (2)	2.219
2020	12,367,900 (2)	2.804
2030	15,628,700 (3)	3.543

(1) Source: Interpolated from 1962-1970 Agricultural GPO data for Southeast area from PRELIMINARY REPORT ON ECONOMIC PROJECTIONS FOR SELECTED GEOGRAPHIC AREAS, 1929-2020, Volume I, prepared for Water Resources Council by U. S. Department of Commerce, Office of Business Economics, 1968.
(2) Source: Ibid.
(3) Extrapolated.

TABLE 9-34

PROJECTION OF ECONOMIC INDICATORS
POPULATION - TRIBUTARY AREA (CODE K)

Year	Total Resident Population	Factor
1966	6,513,026 (1)	1.000
1980	8,015,900 (2)	1.231
1990	9,357,600 (2)	1.437
2000	10,770,000 (2)	1.654
2010	10,917,700 (2)	1.676
2020	14,297,900 (2)	2.195
2030	18,724,700 (3)	2.875

(1) Source: Interpolated from 1960-1970 Population Data from PRELIMINARY REPORT ON ECONOMIC PROJECTIONS FRO SELECTED GEOGRAPHIC AREAS, 1929-2020, Volume I, prepared for Water Resources Council by U. S. Department of Commerce, Office of Business Economics, 1968.
(2) Source: Ibid.
(3) Extrapolated.

TABLE 9-35

PROJECTION OF ECONOMIC INDICATORS
AGRICULTURAL GPO- TRIBUTARY AREA (CODE L)

Year	Value in thousands of 1958 $	Factor
1966	513,976 (1)	1.000
1980	664,600 (2)	1.293
1990	727,900 (2)	1.416
2000	847,900 (2)	1.650
2010	988,400 (2)	1.923
2020	1,187,200 (2)	2.310
2030	1,426,000 (3)	2.774

(1) Source: Interpolated from 1962-1970 Agricultural GPO data from PRELIMINARY REPORT ON ECONOMIC PROJECTIONS FOR SELECTED GEOGRAPHIC AREAS, 1929-2020, Volume I, prepared for Water Resource Council by U. S. Department of Commerce, Office of Business Economics, 1968.
(2) Source: Ibid.
(3) Extrapolated.

TABLE 9-36

PROJECTION OF ECONOMIC INDICATORS
CONSTRUCTION GPO - TRIBUTARY AREA (CODE M)

Year	Value in thousands of 1958 $	Factor
1966	115,805 (1)	1.000
1980	234,700 (2)	2.027
1990	361,600 (2)	3.122
2000	573,000 (2)	4.948
2010	889,100 (2)	7.678
2020	1,371,900 (2)	11.847
2030	2,116,900 (3)	18.280

(1) Source: Interpolated from 1962-1970 total construction earnings data from PRELIMINARY REPORT ON ECONOMIC PROJECTIONS FOR SELECTED GEOGRAPHIC AREAS, 1929-2020, Volume I, prepared for Water Resources Council by U. S. Department of Commerce, Office of Business Economics, 1968.
(2) Source: Ibid.
(3) Extrapolated.

TABLE 9-37

PROJECTION OF ECONOMIC INDICATORS
PAPER GPO - TRIBUTARY AREA (CODE N)

Year	Value in thousands of 1958 $	Factor
1966	195,538 (1)	1.000
1980	401,200 (2)	2.052
1990	596,300 (2)	3.049
2000	867,900 (2)	4.438
2010	1,222,000 (2)	6.249
2020	1,756,700 (2)	8.984
2030	2,525,400 (3)	12.915

(1) Source: Interpolated from 1962-1970 Paper GPO data from PRELIMINARY REPORT ON ECONOMIC PROJECTIONS FOR SELECTED GEOGRAPHIC AREAS, 1929-2020, Volume I, prepared for Water Resources Council by U. S. Department of Commerce, Office of Business Economics, 1968.
(2) Source: Ibid.
(3) Extrapolated.

TABLE 9-38

PROJECTION OF ECONOMIC INDICATORS
CHEMICAL GPO - TRIBUTARY AREA (CODE O)

Year	Value in thousands of 1958 $	Factor
1966	58,186 (1)	1.000
1980	151,000 (2)	2.595
1990	272,200 (2)	4.678
2000	560,000 (2)	9.624
2010	964,000 (2)	16.568
2020	1,537,000 (2)	26.415
2030	2,450,600 (3)	42.116

(1) Source: Interpolated from 1962-1970 Chemical GPO data from PRELIMINARY REPORT ON ECONOMIC PROJECTIONS FOR SELECTED GEOGRAPHIC AREAS, 1929-2020, Volume I, prepared for Water Resources Council by U. S. Department of Commerce, Office of Business Economics, 1968.
(2) Source: Ibid.
(3) Extrapolated.

TABLE 9-39

PROJECTION OF ECONOMIC INDICATORS
PRIMARY METALS GPO - TRIBUTARY AREA (CODE P)

Year	Value in thousands of 1958 $	Factor
1966	153,945 (1)	1.000
1980	254,100 (2)	1.661
1990	327,800 (2)	2.143
2000	427,200 (2)	2.793
2010	562,100 (2)	3.675
2020	752,400 (2)	4.919
2030	1,007,100 (3)	6.585

(1) Source: Interpolated from 1962-1970 Primary Metals GPO data from PRELIMINARY REPORT ON ECONOMIC PROJECTIONS FOR SELECTED GEOGRAPHIC AREAS, 1929-2020, Volume I, prepared for Water Resources Council by U. S. Department of Commerce, Office of Business Economics, 1968.
(2) Source: Ibid.
(3) Extrapolated.

TABLE 9-40

PROJECTION OF ECONOMIC INDICATORS
TEXTILES GPO - TRIBUTARY AREA (CODE Q)

Year	Value in thousands of 1958 $	Factor
1966	300,854 (1)	1.000
1980	583,800 (2)	1.940
1990	851,600 (2)	2.831
2000	1,235,100 (2)	4.105
2010	1,758,700 (2)	5.846
2020	2,487,100 (2)	8.267
2030	3,517,200 (3)	11.691

(1) Source: Interpolated from 1962-1970 Textiles GPO data from PRELIMINARY REPORT ON ECONOMIC PROJECTIONS FOR SELECTED GEOGRAPHIC AREAS, 1929-2020, Volume I, prepared for Water Resources Council by U. S. Department of Commerce, Office of Business Economics, 1968.
(2) Source: Ibid.
(3) Extrapolated.

TABLE 9-41

PROSPECTIVE TONNAGES FOR SELECTED YEARS
(With Improvement to Rome, Georgia)

Commodity	1966	1980	1990	2000	2010	2020	2030	Projection Indicator
UPBOUND								
Rubber, crude	17,600	35,600	55,200	87,300	135,300	207,600	318,500	I
Ore, iron (import)	400,000	801,500	1,186,200	1,594,100	1,999,000	2,461,000	3,000,000	(1)
Sand and gravel	150,000	304,000	468,300	742,200	1,151,700	1,777,100	2,741,900	M
Molasses, blackstrap	22,600	27,000	31,100	35,400	40,300	45,900	52,300	A
Woodpulp	8,300	16,100	23,500	34,100	48,500	68,600	97,100	Q
Benzene	36,500	94,700	170,700	351,300	604,700	964,100	1,537,200	O
Carbon disulphide, liquid	10,000	19,400	28,300	41,000	58,500	82,700	116,900	Q
Caustic soda	25,000	48,500	70,800	102,600	146,100	206,700	292,300	Q
Caustic soda	13,000	26,700	39,600	57,700	81,200	116,800	167,900	N
Chlorine gas	13,000	26,700	39,600	57,700	81,200	116,800	167,900	N
Methanol	3,600	9,300	16,800	34,600	59,600	95,100	151,600	O
Urea solution	8,000	10,300	11,300	13,200	15,400	18,400	22,200	L
Asphalt	11,900	24,100	37,200	58,900	91,400	141,000	217,500	M
Motor fuel	132,000	263,700	405,500	655,200	998,200	1,475,600	2,181,200	F
Fuel oil	8,400	17,200	25,600	37,300	52,500	75,500	108,500	N
Other upbound commerce	86,000							
TOTAL UPBOUND	945,900	1,724,800	2,609,700	3,902,600	5,563,600	7,852,900	11,173,000	

TABLE 9-41 (cont'd)

PROSPECTIVE TONNAGES FOR SELECTED YEARS
(With Improvement to Rome, Georgia)

Commodity	1966	1980	1990	2000	2010	2020	2030	Projection Indicator
DOWNBOUND								
Newsprint	32,000	56,400	79,600	113,300	159,500	223,600	313,000	D
Caustic potash, liquid	9,000	21,200	36,900	72,500	121,400	189,100	294,600	E
Parathion, liquid	4,000	9,400	16,400	32,200	53,900	84,000	130,900	E
Tall oil	5,000	11,800	20,500	40,300	67,400	105,100	163,700	E
Turpentine	5,800	13,700	23,800	46,700	78,200	121,900	189,900	E
Iron & Steel products	164,000	255,100	377,600	507,500	636,400	783,600	955,200	(1)
Other downbound commerce	22,000							
TOTAL DOWNBOUND	241,800	367,600	554,800	812,500	1,116,800	1,507,300	2,047,300	
Total Upbound and Downbound	1,187,700	2,092,400	3,164,500	4,715,100	6,680,400	9,360,200	13,220,300	
With 10% applied to projection	1,187,700	2,301,600	3,481,000	5,186,600	7,348,400	10,296,200	14,542,300	

(1) See special projection indicators developed on page III-9-70

TABLE 9-42

SAVINGS FOR SELECTED YEARS
(With Improvement to Rome, Georgia)

Commodity	1966	1980	1990	2000	2010	2020	2030	Projection Indicator
UPBOUND								
Rubber, crude	$ 17,100	$ 34,600	$ 53,600	$ 84,800	$ 131,400	$ 201,700	$ 309,400	I
Ore, iron (import)	248,000	496,900	735,400	988,300	1,239,400	1,525,800	1,860,000	(1)
Sand and gravel	69,000	139,900	215,400	341,400	529,800	817,400	1,261,300	M
Molasses, blackstrap	32,700	39,100	45,000	51,200	58,200	66,300	75,600	A
Woodpulp	13,400	26,000	37,900	55,000	78,300	110,800	156,700	Q
Benzene	17,900	46,400	83,700	172,300	296,600	472,800	753,900	O
Carbon disulphide, liquid	43,200	83,900	122,300	177,300	252,500	357,100	505,100	Q
Caustic soda	94,800	184,000	268,400	389,200	554,200	783,700	1,108,300	Q
Caustic soda	35,200	72,200	107,300	156,200	220,000	316,200	454,600	N
Chlorine gas	89,800	184,300	273,800	398,500	561,100	806,800	1,159,800	N
Methanol	6,800	17,600	31,800	65,400	112,700	179,600	286,400	O
Urea solution	13,400	17,300	19,000	22,100	25,800	31,000	37,200	L
Asphalt	19,300	39,100	60,300	95,500	148,200	228,600	352,800	M
Motor fuel	186,700	373,000	573,500	926,800	1,411,800	2,087,100	3,085,400	F
Fuel oil	33,500	68,700	102,100	148,700	209,300	301,000	432,700	N
Other upbound commerce	92,100							
TOTAL UPBOUND	1,012,900	1,823,000	2,729,500	4,072,700	5,829,300	8,285,900	11,839,200	

TABLE 9-42 (cont'd)

SAVINGS FOR SELECTED YEARS
(With improvement to Rome, Georgia)

Commodity	1966	1980	1990	2000	2010	2020	2030	Projection Indicator
DOWNBOUND								
Newsprint	$ 68,700	$ 121,200	$ 171,000	$ 243,300	$ 342,400	$ 479,900	$ 672,700	D
Caustic potash, liquid	6,600	15,600	27,000	53,200	89,000	138,700	216,100	E
Parathion, liquid	7,700	18,100	31,600	62,000	103,800	161,800	252,100	E
Tall oil	11,000	25,900	45,100	88,600	148,300	231,100	360,100	E
Turpentine	35,300	83,200	144,700	284,300	476,100	741,700	1,155,500	E
Iron and Steel products	385,400	596,900	883,600	1,187,600	1,489,200	1,833,600	2,235,200	(1)
Other downbound commerce	51,500							
TOTAL DOWNBOUND	566,200	860,900	1,303,000	1,919,000	2,648,800	3,586,800	4,891,700	
Total Upbound and Downbound	1,579,100	2,683,900	4,032,500	5,991,700	8,478,100	11,872,700	16,730,900	
With 10% applied to projection	1,579,100	2,952,300	4,435,800	6,590,900	9,325,900	13,060,000	18,404,000	

(1) See special projection indicators developed on page III-9-70

TABLE 9-43

PROSPECTIVE TONNAGES FOR SELECTED YEARS
(With improvement to Gadsden, Alabama)

Commodity	1966	1980	1990	2000	2010	2020	2030	Projection Indicator
UPBOUND								
Rubber, crude	17,600	35,600	55,200	87,300	135,300	207,600	318,500	I
Ore, iron (import)	400,000	801,500	1,186,200	1,594,100	1,999,000	2,461,000	3,000,000	(1)
Molasses, blackstrap	22,600	27,000	31,100	35,400	40,300	45,900	52,300	A
Woodpulp	8,300	16,100	23,500	34,100	48,500	68,600	97,100	Q
Benzene	36,500	94,700	170,700	351,300	604,700	964,100	1,537,200	O
Carbon disulphide, liquid	10,000	19,400	28,300	41,000	58,500	82,700	116,900	Q
Caustic soda	25,000	48,500	70,800	102,600	146,100	206,700	292,300	Q
Caustic soda	13,000	26,700	39,600	57,700	81,200	116,800	167,900	N
Chlorine gas	13,000	26,700	39,600	57,700	81,200	116,800	167,900	N
Methanol	3,600	9,300	16,800	34,600	59,600	95,000	151,600	O
Urea solution	8,000	10,300	11,300	13,200	15,400	18,400	22,200	L
Asphalt	11,900	24,100	37,200	58,900	91,400	141,000	217,500	M
Motor fuel	132,000	263,700	405,500	655,200	998,200	1,475,600	2,181,200	F
Fuel oil	8,400	17,200	25,600	37,300	52,500	75,500	108,500	N
Other upbound commerce	71,000							
TOTAL UPBOUND	780,900	1,420,800	2,141,400	3,160,400	4,411,900	6,075,800	8,431,100	

TABLE 9-43 (cont'd)

PROSPECTIVE TONNAGES FOR SELECTED YEARS
(With Improvement to Gadsden, Alabama)

Commodity	1966	1980	1990	2000	2010	2020	2030	Projection Indicator
DOWNBOUND								
Newsprint	32,000	56,400	79,600	113,300	159,500	223,600	313,300	D
Caustic potash, liquid	9,000	21,200	36,900	72,500	121,400	189,100	294,600	E
Parathion, liquid	4,000	9,400	16,400	32,200	53,900	84,000	130,900	E
Turpentine	5,800	13,700	23,800	46,700	78,200	121,900	189,900	E
Iron & Steel products	164,000	255,100	377,600	507,500	636,400	783,600	955,200	(1)
Other downbound commerce	21,500							
TOTAL DOWNBOUND	236,300	355,800	534,300	772,200	1,049,400	1,402,200	1,883,900	
Total Upbound and Downbound	1,015,700	1,776,600	2,675,700	3,932,600	5,461,300	7,478,000	10,315,000	
With 10% applied to projection	1,015,700	1,954,300	2,943,300	4,325,900	6,007,400	8,225,800	11,346,500	

(1) See special projection indicators developed on page III-9-70

TABLE 9-44

SAVINGS FOR SELECTED YEARS
(With Improvement to Gadsden, Alabama)

Commodity	1966	1980	1990	2000	2010	2020	2030	Projection Indicator
UPBOUND								
Rubber, crude	$17,100	$34,600	$53,600	$84,800	$131,400	$201,700	$309,400	I
Ore, iron (import)	248,000	496,900	735,400	988,300	1,239,400	1,525,800	1,860,000	(1)
Molasses, blackstrap	26,900	32,100	37,000	42,100	47,900	54,600	62,200	A
Woodpulp	13,400	26,000	37,900	55,000	78,300	110,800	156,700	Q
Benzene	17,900	46,400	83,700	172,300	296,600	472,800	753,900	O
Carbon disulphide, liquid	43,200	83,900	122,300	177,300	252,500	357,100	505,100	Q
Caustic soda	94,800	184,000	268,400	389,200	554,200	783,700	1,108,300	Q
Caustic soda	35,200	72,200	107,300	156,200	220,000	316,200	454,600	N
Chlorine gas	89,800	184,300	273,800	398,500	561,100	806,800	1,159,800	N
Methanol	6,800	17,600	31,800	65,400	112,700	179,600	286,400	O
Urea solution	13,400	17,300	19,000	22,100	25,800	31,000	37,200	L
Asphalt	19,300	39,100	60,300	95,500	148,200	228,600	352,800	M
Motor fuel	135,400	270,500	415,900	672,100	1,023,900	1,513,600	2,237,600	F
Fuel oil	23,100	47,400	70,400	102,500	144,400	207,500	298,300	N
Other upbound commerce	78,400							
TOTAL UPBOUND	862,700	1,552,300	2,316,800	3,421,300	4,836,400	6,789,800	9,582,300	

TABLE 9-44 (cont'd)

SAVINGS FOR SELECTED YEARS
(With Improvement to Gadsden, Alabama)

Commodity	1966	1980	1990	2000	2010	2020	2030	Projection Indicator
DOWNBOUND								
Newsprint	$68,700	$121,200	$171,000	$243,300	$342,400	$479,900	$672,700	D
Caustic potash, liquid	6,600	15,600	27,000	53,200	89,000	138,700	216,100	E
Parathion, liquid	7,700	18,100	31,600	62,000	103,800	161,800	252,100	E
Turpentine	25,100	59,200	102,900	202,200	338,500	527,400	821,600	E
Iron and Steel products	385,000	596,900	883,600	1,187,600	1,489,200	1,833,600	2,235,200	(1)
Other downbound commerce	49,300							
TOTAL DOWNBOUND	542,400	811,000	1,216,100	1,748,300	2,362,900	3,141,400	4,197,700	
Total Upbound and Downbound	1,405,100	2,363,300	3,532,900	5,169,600	7,199,300	9,931,200	13,780,000	
With 10% applied to projection	1,405,100	2,599,600	3,886,200	5,686,600	7,919,200	10,924,300	15,158,000	

(1) See special projection indicators developed on page III-9-70

Induced savings, Parts A and B as described heretofore, were projected over the life of the project by application of appropriate indicators listed in table 9-23. The savings apply to both a waterway terminating at Gadsden and at Rome. Projected savings are as follows:

Projection of Total Savings for Induced Effects - Part A
(Values in thousands of dollars)

Commodity	Projection Indicator Code	1966	1980	1990	2000	2010	2020	2030
Sulphur liquid (upbound)	O	94.6	245.5	442.5	910.4	1,567.3	2,498.9	3,984.2
Sulphuric acid (upbound)	P	19.2	31.9	41.1	53.6	70.6	94.4	126.4
Sulphuric acid (downbound)	J	28.4	37.6	42.9	52.3	63.0	79.6	100.6
Savings on induced traffic		142.2	315.0	526.5	1,016.3	1,700.9	2,672.9	4,211.2
Induced tons (1,000)		46.4	92.5	145.3	263.2	428.6	662.9	1,030.4

The methodology for computing induced savings for Part B consists of using 75% of the difference between the projected tonnage after 1980 and the 1980 tonnage.
Induced savings = 75% of incremental tons after 1980 multiplied by net unit savings. The induced savings are shown in the tabulation below.

Part B - Values in thousands of dollars

Commodity	Indicator Code	1980	1990	2000	2010	2020	2030
Benzene	O	0	168.2	569.9	1,128.4	1,923.8	3,191.6
Methanol	O	0	16.5	56.1	111.2	190.0	314.8
Caustic potash liquid	E	0	47.1	153.6	299.6	502.3	818.3
Parathion, liquid	E	0	21.7	70.1	136.9	229.6	373.5
Pipe and fittings	B	0	24.4	63.4	119.8	202.3	323.7
Total savings			277.9	911.1	1,795.9	3,048.0	5,021.9
Tons (pipe and fittings)[1]		0	7.4	19.2	36.3	61.3	98.1

[1] All other tonnages shown in tables 9-41 and 9-43.

Summary of transportation benefits. - Transportation benefits are summarized and converted to average annual equivalent values in table 9-45. The table includes induced tons (induced tons of sulphur, sulphuric acid, and pipe and fittings listed in the two foregoing tabulations) and their savings.

TABLE 9-45

PROJECTED ANNUAL TONNAGES AND SAVINGS FOR SELECTED YEARS DURING LIFE OF PROJECT

	Improvement to Gadsden		Improvement to Rome	
Year	Tons	Savings	Tons	Savings
1966 [1]	1,062,100	$1,547,300	1,234,100	$1,721,300
1980 [2]	2,046,800	2,914,600	2,394,100	3,267,300
1990	3,096,000	4,690,600	3,633,700	5,240,200
2000	4,608,300	7,614,000	5,469,000	8,518,300
2010	6,472,300	11,416,000	7,813,300	12,822,700
2020	8,950,000	16,645,200	11,020,400	18,780,900
2030 [3]	12,475,000	24,391,100	15,670,800	27,637,100

[1] Base year

[2] Beginning of project life

[3] End of 50-year project life

The average annual equivalent transportation benefits or savings for the improvement considered for the Coosa River navigation project, based on a 50-year project life (1980-2030) and a discount rate of 3¼%, would be as follows:

Montgomery to Gadsden	$8,369,000
Gadsden to Rome (incremental)	1,035,000
Montgomery to Rome	9,404,000

18. RECREATIONAL BOATING BENEFITS

Provision of locking facilities will increase the utility of recreational boating to users of the Coosa River System, particularly to craft designed for extended cruises. The basis for estimating the increase in use is related to observed patterns of ownership for various waterways in Alabama. Registration is required by State Law and registration by classes is reported by county.

Boating registration confirms that location of larger craft is limited to counties adjacent to large reservoirs, waterways or on the Gulf, as would be expected. In addition, the data indicates that usage for larger craft can be related to the presence of sufficient length to allow longer cruises. While surface area can be related, with somewhat less confidence, population and incomes do not offer a consistent explanation as to the difference of use between waterways.

This analysis is based primarily on comparison between the existing Tennessee River system, and the existing Coosa system in Alabama. Navigation is maintained along the Tennessee, but the Coosa is improved by separate reservoirs only. The following tabulation indicates available data for comparing the two systems:

Item	Alabama counties adjacent to	
	Tennessee System	Coosa System
Registration of water craft		
over 40' long	39	13
from 26' to 40' long	289	191
Population in 1960	473,060	608,329
Aggregate personal income in 1959	$603,000,000	$732,000,000
Water surface area (acres)	151,900	78,700
Maximum continuous length of water surface	200 miles[1]	60 miles (w/o locks) 262 miles[2] w/locks)

[1]Mile 216 to mile 416.

[2]Mile 18 to mile 280.

While the data above is too limited in observation to allow valid statistical analysis and inference, it is believed that they form a usable basis for estimating additional boating use and benefits for the addition of lock facilities.

An increased fleet of 26 craft over 40' and 98 craft for 26-40 feet could be implied from the data given ablve. However, the expected value for these larger craft carries a larger variance than would be true for smaller, less expensive craft. Therefore, a reduction by one-half has been applied as a hedge against the increased variance.

By means of the small boat formula (EM 1120-2-113) and based on the foregoing assumptions, the following recreational boating benefits are estimated to accrue from addition of locks to the Coosa River System:

Avg. length of vessel	Cost per foot	Avg. value per vessel	No. of new vessels	Total value of new fleet
33' (26' -40')	$ 540	$17,800	98	$1,709,000
44' (over 40')	1,000	44,000	13	572,000

Avg. length of vessel	Depreciated value	Rate of return	Increased return
33'	$855,000	9%	$77,000
44'	286,000	7%	20,000
		Total	$97,000

Thus the increased utility to new owners of water craft induced by addition of locks is estimated at $97,000 annually, initially. Future increases in population and incomes will add additional new users to the waterway. The Bureau of Outdoor Recreation has projected an increase in recreational boating activity days for Water Sub-region E (containing Coosa River System) of $\frac{140.8}{11.2}$ = 12.57 times from 1965 to 2020. The projection factors, based on BOR data, extrapolated to year 2030, are as follows:

Year	Boating activity days (millions)	Ratio to 1965
1965	11.2	1.000
1980	23.9	2.134
2000	59.1	5.277
2020	140.8	12.571
2030	181.0[1]	16.161

[1] Extrapolated

With an adjustment to 1980 as the base year and utilizing projected increases in recreational boating activities as developed by the BOR, the average annual equivalent benefits are estimated to be $601,000. By reaches, the average annual equivalents are:

Montgomery to Gadsden	$367,000
Gadsden to Rome	234,000
Total (Montgomery to Rome)	601,000

19. REDEVELOPMENT BENEFITS

The proposed navigation project, being located in Appalachia, lies within an area of substantial and persistent unemployment and underemployment. All of parts of six counties within commuting distance of the project construction sites have been designated as redevelopment areas under Title IV of the Public Works and Economic Development Act of 1965, Public Law 89-136. The six affected areas are Bibb and Randolph Counties and the Pell City area in St. Clair County in Alabama; and the Trenton area of Dade County, the Chatsworth area of Murray County and the Dallas area in Paulding County in Georgia. The benefit due to area redevelopment attributable to the navigation project would result from labor costs for construction, operation and maintenance of the project.

Detailed analysis of construction costs of various navigable waterway projects indicated labor costs to be about 22 percent of project construction costs (excluding land and damages). Labor costs for operation and maintenance were found to approximate 24 percent of the total expenditures. Further analysis was made to determine the degrees of skill required in project construction and what portion of these labor skills could be furnished from the locally unemployed or underemployed. The results are presented as a part of table 9-46.

Redevelopment benefits credited to the regional account consist of the average annual equivalent of all labor used in construction, operation and maintenance of the waterway. Benefits credited to the national account are the wage payments made to persons who: would otherwise be unemployed or underemployed; who live in the project area within commuting distance of the project; and, who possess the necessary skills required for project construction. The skill requirement factors creditable to the regional and national accounts are shown in table 9-46 and the redevelopment benefits are presented in table 9-47.

Table 9-46

LABOR SKILL REQUIRED FOR CONSTRUCTION, OPERATION AND MAINTENANCE OF THE PROJECT

Item	Labor required (percent)	Supplied locally (percent)	Redevelopment factor National account	Redevelopment factor Regional account
Construction				
Skilled	40	60	0.24	0.40
Semi-skilled	50	70	0.35	0.50
Unskilled	10	100	0.10	0.10
Total	100		0.69	1.00
Operation and Maintenance				
Skilled	50	60	0.30	0.50
Semi-skilled	30	70	0.21	0.30
Unskilled	20	100	0.20	0.20
Total	100		0.71	1.00

Table 9-47

PROJECT COSTS AND REDEVELOPMENT BENEFITS ($1,000)

Item	Expenditure	Labor costs [1]	Annual Redevelopment benefits: National account [2]	Annual Redevelopment benefits: Regional account [3]
Construction				
Montgomery-Gadsden	162,710	35,771	1,005	1,457
Gadsden-Rome	26,851	5,907	166	241
Montgomery-Rome	189,561	41,678	1,171	1,698
Annual Operation and Maintenance				
Montgomery-Gadsden	528	127	31	127
Gadsden-Rome	127	30	7	30
Montgomery-Rome	655	157	38	157
Benefits				
Montgomery-Gadsden			1,036	1,584
Gadsden-Rome			173	271
Montgomery-Rome			1,209	1,855

1 Labor cost is estimated to be 22 percent of construction costs less lands and damages; 24 percent of operation and maintenance expenditures.

2 Using 3¼% interest rate and appropriate redevelopment factor, benefits were discounted to reflect a 20-year time horizon.

3 Discounted for 3¼% interest rate.

20. LAND ENHANCEMENT BENEFITS

Provision of navigation along the Coosa River will allow a shift in land use with subsequent appreciation of land values accruing to this change. In common with the measurement procedures utilized for other user benefits, the "with and without" principle has been utilized to estimate land enhancement benefits. Analysis of transportation savings has led to a delineation of traffic induced by the waterway. The induced traffic will require additional plant and equipment investment entailing additional lands. The economic impact analysis included as Section IV of this report indicates the presence at over 60,800 acres of high potential industrial sites along the Coosa River. About 1,773 acres of additional sites would be required to support the additional output of the chemical and steel industries delineated as induced traffic.

A summary of the calculation is presented below:

	1990	2000	2010	2020	2030
Chemical Products					
Induced traffic (tons)	132,400	438,200	864,900	1,468,700	2,422,600
Gross value of induced traffic ($1,000)	31,719	103,892	204,682	343,867	566,816
Additional Employment	919	2,373	3,790	5,023	7,175
Acreage to support addl. employment	190	497	795	1,065	1,522
Steel Products					
Induced traffic (tons)	7,400	19,200	36,300	61,300	98,100
Gross value of induced traffic ($1,000)	2,072	5,375	10,162	17,161	27,463
Additional Employment	208	270	430	620	820
Acreage to support addl. employment	30	70	119	201	251
Total Added Acreage	220	567	914	1,266	1,773

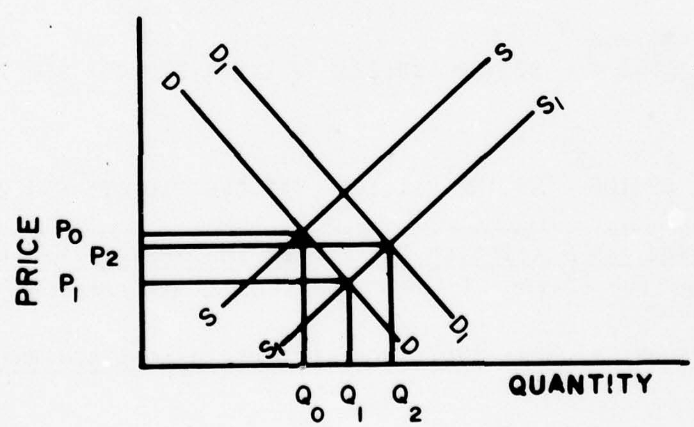
The net increase in land values expected to accrue as a result in changes from current agricultural to industrial use is predicated upon capitalized returns to land rent, representing increased economic returns and was based upon recent transactions for similar uses in the area. Improved

industrial sites are considered to be valued at about $7,500 per acre and about $2,500 per acre for site improvement costs can be expected. Current value for similar land in agricultural uses is about $175, thus the increment of gain per acre is $4,825 = 7500 - (2500 + 175). Discounting the gain over the 50-year development period based on the growth curve implied by projected traffic increases results in average annual equivalent benefits of $176,000.

Land along the Coosa River Waterway is, at the present time, held by many owners, and no windfall gains are anticipated.

21. DEVELOPMENTAL WAGE BENEFITS

Addition of the Coosa River Waterway to the existing transportation system of this area of Appalachia will improve the competitive position of the area to supply the rapidly growing southeastern regional market, both inside and outside of Appalachia. The operating costs of plants utilizing waterway transportation will be reduced and subsequently an increase of output due to reduced prices can be expected. The anticipated increases in output can be attributed both to a shift in the supply schedule of the firms located along the waterway via the price elasticity of demand and through a shift in the demand schedules facing each firm. In the context of the competitive equilibrium position for each firm there are shifts in both schedules, each of which would result in an increase in output. The following graphic describes the shift:



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DEVELOPMENT OF WATER RESOURCES IN APPALACHIA. MAIN REPORT. PART--ETC(U)
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An estimated shift in quantity for the chemical and steel products industries was identified in the traffic and transportation benefit analysis. Induced transportation benefits represent additional output and employment within these industries and are considered to be relevant indicators of regional income gains which could be expected from the waterway.

The change in output in chemical and steel products movements identified in the induced traffic analysis was made to form a basis for land enhancement benefits described previously. Utilizing these estimates and the wage levels typical of the state of Alabama and reported in Employment and Earnings[1] the change in incomes can be estimated. Real changes in output per employee to permit the wage payments to be in real terms have been projected over the 50-year project life. A two percent increase in real wages can be described by historical records and is considered to be a reasonable forecast value.

The change in employment for each industry is given below:

Year	1980	1990	2000	2010	2020	2030
Chemical Products	0	919	2373	3790	5023	7175
Steel Products	0	208	270	430	620	820

Wages per employee, projected for the potential change in real output is given below:

Year	1967	1980	1990	2000	2010	2020	2030
Chemical Products							
Weekly	$112.67[2]						
Annually	$5,850	$7,750	$9,225	$11,244	$13,707	$16,708	$20,370
Steel Products							
Weekly	$136.57[2]						
Annually	$7,100	$9,187	$11,196	$13,646	$16,635	$20,278	$24,722

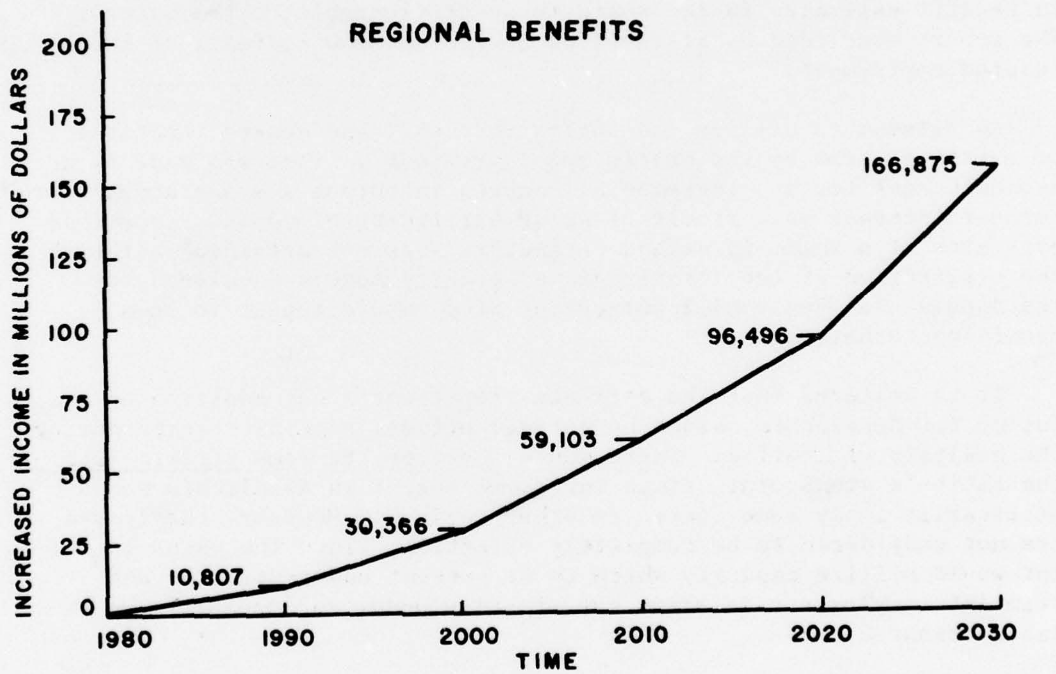
[1]Employment and Earnings Statistics for States and Areas, 1939 to 1967; published by the Bureau of Labor Statistics, United States Department of Labor.

[2]Average weekly wages, Alabama 1967, Source: Employment and Earnings.

The product of employment times wages gives the estimated change in income attributable to the project. The following tabulation gives the estimated income gains for the Appalachian Region.

Year	1990 ($1000)	2000 ($1000)	2010 ($1000)	2020 ($1000)	2030 ($1000)
Chemical Products	8,478	26,682	51,950	83,924	146,155
Steel Products	2,329	3,684	7,153	12,572	20,720
Total	10,807	30,366	59,103	96,496	166,875

The following graphic illustration gives the basis for calculating the average annual regional benefits associated with the addition of navigation to the Coosa River system. A weighted employment multiplier based on the Nathan county multipliers for the 12-county impact area of the waterway was utilized to account for the additional indirect effects of employment expansion. Average annual equivalent benefits of about $54.6 million are estimated for the waterway.



Accumulated Present Worth (3¼% discount rate) = $680,318,000
Capital recovery factor (3¼% - 50 years) = .04073
Average Annual Equivalent = 680,318,000 x .04073 = $ 27,709,000
Regional Multiplier = 1.97
Average Annual Equivalent Benefit =
$27,709,000 x 1.97 = $ 54,600,000

The effects of the above estimated increase of employment on national income was determined with reliance on the procedures utilized in calculating redevelopment benefits. All the regional gains are counted as national income gains the first year with a uniform decrease to zero in the twentieth year (2000). At an interest rate of 3¼ percent, the present worth of the decreasing annuity is $65,857,000 and the average annual equivalent thereof over the 50-year economic life of the project is $2,700,000.

A number of methods for estimating regional changes attributable to the Coosa River Navigation Project have been attempted during the progress of this study. Since the proposal is an addition of locks to an existing reservoir system, the delineation of benefits incremental to the existing reservoir system has been the primary difficulty. A land use capability and planning analysis was utilized in the Southern Research Institute impact study attached to this report. The report indicates an ample supply of well located industrial sites along the Coosa River served by rail, waterway and highway transportation facilities, accessible to urban centers and supplied by an adequately trained work force. The only problem in benefit estimates is the share to be attributable to the waterway. The report concluded by attributing a high and low estimate of barge-related employment.

An attempt to utilize the shifts in supply and demand functions of existing firms by the static model previously cited was made by an economic task force. Incremental changes in output average about four percent increase as a result of price elasticity of demand. Operable estimates of a shift in demand parameters were not attained, although the utilization of the inter-regional gravity models developed for the Appalachian Regional Input-Output study would appear to be a promising technique.

It is believed that the estimates represent a net addition of income for Appalachia, since no defined offsets were discovered during the analysis of traffic. There would, however, be some offsets from the Nation's standpoint, since shifts in output in Appalachia would necessarily imply some losses to other regions. However, the losses are not considered to be completely offsetting since the gains in output would utilize capacity which is at present under-utilized and stimulate employment in areas experiencing under and unemployment of labor resources.

22. SUMMARY OF NAVIGATION AND RELATED BENEFITS

A summary of benefits creditable to the National Account is given in table 9-48. The benefits represent average annual equivalent values at a discount rate of 3¼ percent for the 50-year economic life of the project (1980-2030).

TABLE 9-48

SUMMARY OF BENEFITS ($1,000)

Item	Montgomery to Gadsden	Gadsden to Rome	Montgomery to Rome
Transportation Savings	8,369	1,035	9,404
Recreational Boating	367	234	601
Economic Redevelopment	1,036	173	1,209
Total	9,772	1,442	11,314
Developmental Wages	2,700	0	2,700

SECTION IV - ECONOMIC IMPACT

23. INTRODUCTION

Throughout the investigations required for the preparation of this economic restudy of the Coosa River Navigation Project the Coosa-Alabama River Improvement Association has worked diligently and cooperated effectively with the Corps of Engineers. One of the most valuable supportive measures of the Association was the preparation, by contract with the Southern Research Institute, of a document entitled "Part I, Economic Impact" of the Final Report to the Association.

This report presents a very thorough analysis of the socioeconomic development of the Coosa River Valley and its environs, present and future. In the course of this study, the Institute found that Jefferson County, Alabama (Birmingham), and Hamilton County, Tennessee (Chattanooga), should be deleted from the 36-county area selected for analysis, due to their predominant use of the facilities of the existing navigation projects on the Tombigbee-Warrior and Tennessee Rivers. The Institute identified 12 counties as the primary impact area and the remaining 22 counties of the study area as tributary to the Coosa River Navigation Project.

This report is presented in this section, modified only by the addition of the page numbers of this chapter and by the deletion of Appendix A, which consists of 25 illustrations of potentially suitable water-oriented industrial sites in the Coosa River Impact Area. The complete report is on file in the Office of Appalachian Studies and, together with other detailed information, in the office of the Coosa-Alabama River Improvement Association.

POTENTIAL BARGE TRAFFIC BETWEEN MONTGOMERY, ALABAMA AND ROME, GEORGIA

PART I

ECONOMIC IMPACT

Final Report to

COOSA-ALABAMA RIVER IMPROVEMENT ASSOCIATION

SOUTHERN RESEARCH INSTITUTE

2000 9th Avenue S. Birmingham, Alabama 35205

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POTENTIAL BARGE TRAFFIC BETWEEN
MONTGOMERY, ALABAMA AND ROME, GEORGIA
PART I
ECONOMIC IMPACT

Final Report to

COOSA-ALABAMA RIVER IMPROVEMENT ASSOCIATION

Southern Research Institute
Birmingham, Alabama
February 21, 1968
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TABLE OF CONTENTS

TABLE OF CONTENTS (Cont'd)

TABLE OF CONTENTS (Cont'd)

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POTENTIAL BARGE TRAFFIC BETWEEN MONTGOMERY, ALABAMA AND ROME, GEORGIA

PART I

ECONOMIC IMPACT

I. INTRODUCTION

A. Scope of Work

The work undertaken in the preparation of this report was initiated under two proposals from Southern Research Institute to the Coosa-Alabama River Improvement Association. The first proposal, number 3114R, was issued on June 16, 1967 and listed three purposes:

1. to investigate the nature and volume of barge traffic that might originate or terminate in Jefferson County, Alabama and that could be expected to move on the Alabama and Coosa Rivers between Montgomery, Alabama and Rome, Georgia, if these rivers were open to navigation.

2. to investigate (a) the direct impact that the opening of these rivers to navigation can be expected to have on the volume of barge traffic of local users who may benefit from the waterway and (b) the subsequent impact that possible increases in the users' barge traffic can be expected to have on employment, wage spending, and investment spending of these users, and the secondary or induced effects these increases may have on the economy of the economic tributary area; and

3. to give consideration—to the extent the data are readily available—to a number of other related matters that pertain to: (a) the broad economic changes that are already under way and that are expected to develop in the economic tributary area of the waterway and (b) the local availability of labor, capital, suitable industrial property, and other inputs necessary for facilitating the expansion that may become possible because of the navigation development program.

While the information sought under proposal 3114R was being developed, the Coosa-Alabama River Improvement Association, at the suggestion of the Corps of Engineers, requested a change in part of the scope of the work, particularly in that part pertaining to items (2) and (3) above, and these changes were subsequently outlined in a letter of October 25, 1967 from Southern Research Institute to the Coosa-Alabama River Improvement Association. The revised scope called for:

1. a delineation of those counties in the 36-county study area that are expected to be affected most by the Coosa's water development programs; a delineation, too, of the major "growth" subregions and important growth communities or zones that are expected to be affected by the Coosa development program;

2. a determination of benchmark- and normal-growth patterns expected to develop by 2030 and a review of conditions likely to cause normal growth to be greater or less than benchmark growth;

3. an identification and evaluation of the supply of developable land along the Coosa that can be expected to provide the loci for economic expansion in the growth areas related to waterway;

4. a determination of nodal land requirements and of the sufficiency of available land for the normal growth of industry and population expected to 2030;

5. an estimation of the impact of water-oriented industry in nodal growth areas, with particular attention to employment, earnings, and capital effects;

6. an estimation of the contribution of the growth of water-oriented industry to attainment of Coosa-area benchmarks, assuming receipt of suitable criteria for measuring this contribution from the Corps of Engineers.

B. Summary of Findings

The information developed in the course of the work under both proposals is summarized briefly below. More detailed findings are presented in the remainder of this section of the report on the economic impact, and in the section containing the county reports.

1. Jefferson County barge-traffic survey

A barge-traffic survey of Jefferson County revealed about 155 establishments that might have a reasonable interest in Coosa barge facilities. Of these, almost 50, including the potentially most important, responded to the survey and reported little or no interest. Recontacts with selected respondents and direct contacts with selected non-respondents again revealed little or no interest in Coosa barge traffic. All of the specific information obtained during this survey was presented to the Mobile District, Corps of Engineers.

2. County reports

The separately bound second section of this final report entitled County Reports presents a detailed analysis of economic conditions in 36 counties (including Jefferson County, Alabama) that may be described as the economic tributary area of the Alabama and Coosa Rivers between Montgomery, Alabama and Rome, Georgia. This detailed analysis was undertaken in conjunction with the third objective outlined in proposal 3114R, dated June 16, 1967—that of providing a review of economic trends and changes at work in the economic tributary area. This part was prepared in conjunction with work on a county-by-county level being carried out for the Corps of Engineers.

These reports reveal, generally, that the population of the area is older in age than the average for the states (Alabama and Georgia) of which they are a part and the nation, that young adults are relatively few in number, and that the size of the population in the area as a whole is growing more slowly than in the same states and the nation. Also, population densities in the area are relatively low, in keeping with the predominantly rural or underdeveloped character of these counties.

Absolute levels of income are relatively low, but are tending to rise somewhat faster than the states of which the counties are a part.

These reports also reveal that labor participation rates are relatively low and that unemployment rates tend to be relatively high. The general levels of educational attainment of adults was found to be relatively low.

There has been a general shift in recent years from extractive to manufacturing and service-type industries. Employment within agriculture has not only declined, but has shifted from row crops to meat products. Mining is tending to disappear. Employment in manufacturing appears to favor relatively low-wage industries.

The area appears to be relatively poor in exploitable resources, with the possible exception of land for grazing, woodpulp, and water—depending on water-quality requirements. Transportation facilities generally appear to be adequate for economic growth in many sections, especially if planned interstate highways are considered. Trends of financial activity, namely time and demand deposits, seem to present an unclear, mixed picture.

Generally speaking, predominantly urban counties were found to show more promising growth potentials than predominantly rural counties.

3. Economic impact

a. Impact areas

A review of the various present and prospective uses of the Coosa-Alabama waterway between Montgomery, Alabama and Rome, Georgia indicated that the major impact of this waterway can be expected to fall on the 12 counties that are bisected by or that lie adjacent to the waterway. This view was also generally supported by the results of the county-by-county economic review.

The important growth communities and zones within this 12-county area were identified. For the most part they were considered to be the established urban centers. The areas surrounding Montgomery, Birmingham, Gadsden, and Anniston, Alabama and Rome, Georgia were deemed to

be the most important growth areas. Division of the impact counties into "growth" subregions was undertaken by the Mobile District, Corps of Engineers in carrying out benchmark- and normal-growth disaggregations.

b. Benchmark- and normal-growth patterns in the impact counties

Benchmark- and normal-growth disaggregations of "growth" subregion employment data were carried out for the period 1980 to 2030, and these data were projected to 2030 by Southern Research Institute. A comparison of the disaggregated and projected data revealed that, on a first-approximation basis, none of the Appalachian counties could be expected to reach benchmark employment or population values, although Floyd County, Georgia might approach benchmark employment values. Precise comparisons could not be made for Montgomery and Autauga counties because benchmarks were developed for Appalachian counties only, although Autauga County might reach benchmark, had benchmark values been established for it. Economic conditions in the 12-county impact area were found to be similar in many respects to conditions found in the 36-county economic-tributary study area indicated above. As in the broader region, predominantly urban counties in the impact area generally appear to fare better than predominantly rural counties.

c. Land for water-oriented industry

An investigation of potentially suitable water-oriented industrial land was carried out and was based primarily on analysis of pertinent geodetic-survey and water maps and on aerial inspection and photography. This investigation preliminarily identified 78 sites that might meet criteria. Further analysis found that only 41 of these sites could be regarded as generally suitable. These 41 sites were found to contain more than 62,000 acres. Projected normal-growth demand for water-oriented industrial land was found to amount to almost 2,300 acres by the year 2030; benchmark-growth demand amounted to about 3000 acres. Thus, a significant excess of water-oriented industrial sites is indicated, and it was concluded that availability of water-oriented industrial sites cannot constitute an impediment to either normal or benchmark growth.

Because of the importance of this land as a basic resource and because of the likelihood of encroachment by recreation and residential uses, it may be advisable to consider steps that would preserve the sites for industrial purposes.

d. Land for other purposes

A survey of use, availability, and demand for land for all purposes other than water-oriented industry was also undertaken to determine whether the availability of this land could be expected to be sufficient to sustain normal and benchmark growth in the impact area to 2030. Anticipated increases in the land expected to be required during the projection period were allocated to various urban centers. A map was prepared that outlined the urban growth areas and the amount and pattern of growth that could be expected in land use in each urban area. All told, 53,000 acres of additional urban land are expected to be needed by 2030, in contrast to approximately 132,000 acres used for urban purposes in 1960. Evolving land-use patterns reflect a general trend toward decreased land-use densities, and it was concluded that there is ample land available in the impact area to sustain normal or benchmark growth to 2030.

e. Employment, income, and investment effects

Anticipated employment, income, and investment effects of the impact of normal growth of water-oriented industry were calculated for the impact area by decade for the period 1980 to 2030. Delineation was also made for the barge-oriented portion of water-oriented plants. A further delineation of the findings was made for the lower and upper portions of the Coosa navigation channel under consideration.

The primary inputs for these calculations were the normal growth estimates of employment, a skill composition of employment derived from population-census data, average annual wages derived from manufacturing-census data, capital outlays derived from a variety of published sources, and the so-called "Nathan multipliers."

The findings revealed by this analysis include the following important points:

1. the number of management and management-support personnel can be expected to show a significant increase in the proportion of total employment in water- (as well as barge-) oriented plants in the impact area by 2030;

2. the direct employment of water-oriented industry in the impact area was expected to amount to more than 75,000 persons with total annual direct wages of about $2.1 billion by 2030; the employment induced by the water-oriented industry was expected to amount to almost 85,000 persons with total annual induced wages of about $1.9 billion. The attempt to develop annual average wages by occupational skill for each water-oriented industry with the use of readily available data did not yield satisfactory results.

3. the direct barge-oriented employment was expected to range between wide extremes, depending upon the assumption made about the relative importance of barge navigation to decisions of plant management to remain in, expand in, or move plants into the impact area. The estimates revealed that direct barge-oriented employment may range from a low of approximately 760 persons with total annual direct wages of about $6.1 million in 1980 to almost 30,000 persons with total annual direct wages of about $840 million in 2030.

4. the employment induced by barge-oriented employment may range from a low of about 830 persons with total annual induced wages of $5.3 million in 1980 to more than 33,000 persons with total annual induced wages of more than $750 million in 2030.

5. the annual investment associated with barge-oriented employment may be expected to range as follows:

	low in 1980	high in 2030
Industrial	$28.6 million	$2,168.7 million
Commercial	0.2 million	22.7 million
Residental	0.9 million	109.3 million
Federal	0.7 million	80.9 million
State and local	0.5 million	60.5 million

6. the unemployment in 1966 was reported to be about 9,260, in contrast to employment of about 231,000, and the unemployment in excess of 4% was estimated at about 1,360; the underemployment in the impact area in 1960, based on the difference between national and county labor participation rates, was estimated at about 18,000 persons.

f. Overall impact of water- and barge-oriented industry

The findings of the impact study, as outlined above, revealed that the 12 counties that adjoin the Coosa and Alabama Rivers or through which the rivers flow between Montgomery and Rome should be considered the Coosa River impact area. The findings also reveal that there is a sufficient quantity of suitable land for normal and benchmark growth of water-oriented uses and all other uses in the impact area. Furthermore, the findings indicate that general employment induced by barge-oriented employment in 2030 can probably be expected to eliminate the number of persons in excess unemployment in 1966 and make a significant contribution toward the elimination of underemployment.

II. DELINEATION OF THE COOSA RIVER IMPACT AREA

A. Impact Counties

Twelve counties, which are directly contiguous to the Coosa and Alabama Rivers between Montgomery, Alabama and Rome, Georgia or through which these rivers flow, are expected to be affected most by further development and use of this waterway. These 12 impact counties are (see Figure 1):

Autauga, Alabama	Etowah, Alabama
Calhoun, Alabama	Montgomery, Alabama
Cherokee, Alabama	Shelby, Alabama
Chilton, Alabama	St. Clair, Alabama
Coosa, Alabama	Talladega, Alabama
Elmore, Alabama	Floyd, Georgia

This conclusion is based on a review of five categories of future use or control of this waterway: 1) as a potential navigation channel; 2) as a source of water and as a sanitary system for urban and industrial needs; 3) as a recreation base; 4) as a power source; 5) and as a flood-control system. Use of the waterway for still another purpose, agriculture, is believed to be nominal or nonexistent and, in any event, would be restricted to lands along the shores of the waterway.

Expected potential barge traffic was found to originate or terminate in all of these 12 counties and in 8 additional counties within the 36-county area that was surveyed for the Corps of Engineers for expected potential Coosa barge traffic. Significant potential tonnages were found to originate or terminate in only 5 of the 12 impact counties—Floyd, Etowah, Calhoun, Talladega, and Montgomery, and primarily in the major urban areas of those counties. More than nominal quantities were also credited to Bartow County, Georgia, but this county was excluded from the list of impact counties because a review indicated the probability that overall future economic development in Bartow will not be closely oriented to the Coosa River.

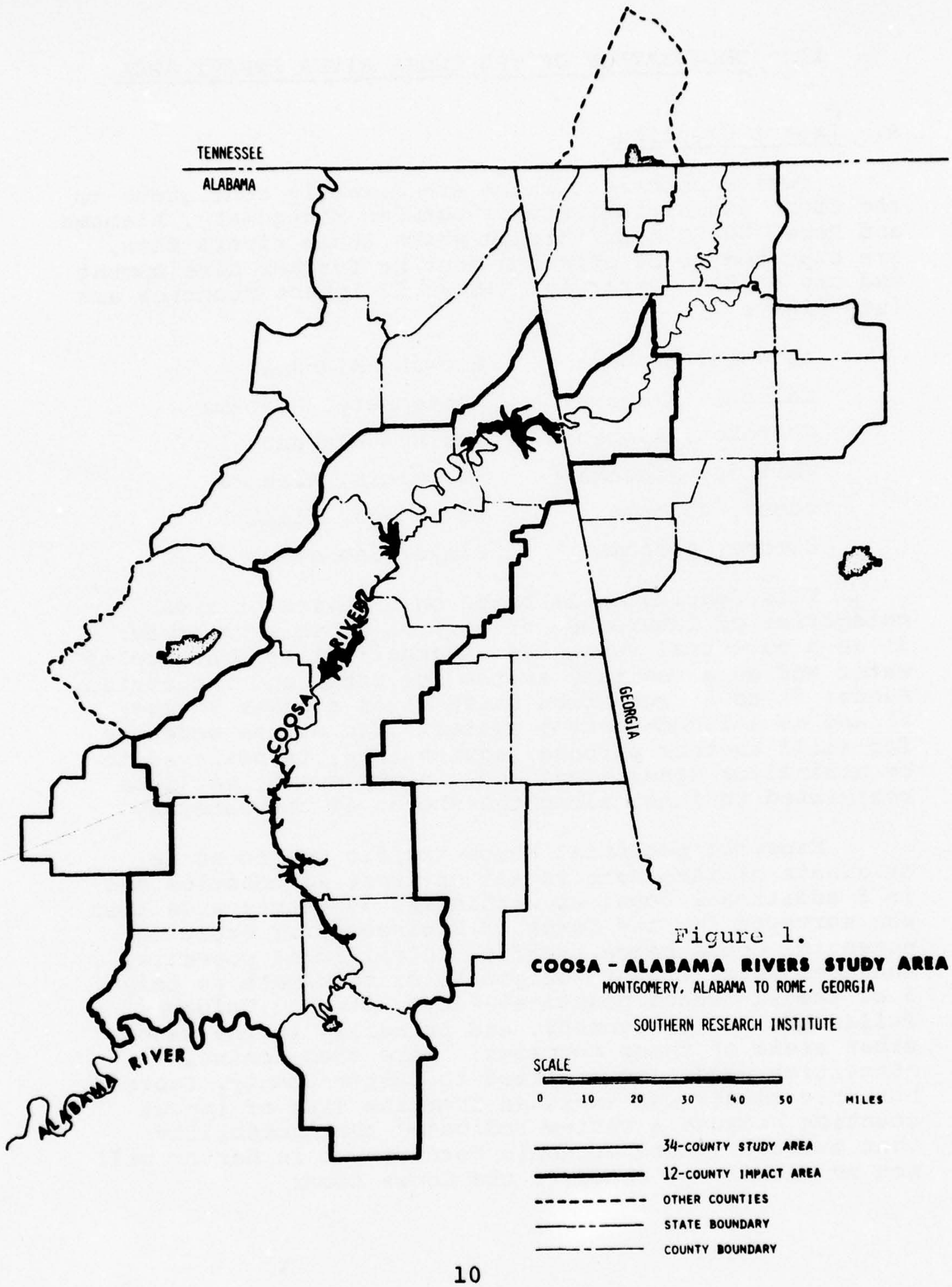

Figure 1.
COOSA - ALABAMA RIVERS STUDY AREA
MONTGOMERY, ALABAMA TO ROME, GEORGIA

SOUTHERN RESEARCH INSTITUTE

Direct use of the waterway as a source of water for urban or industrial purposes was deemed to be limited normally to areas within about 10 miles of the waterway, if not actually to land directly contiguous to the river, as in the case of manufacturing plants that require substantial quantities of water for processing. Thus, the urban or industrial areas that are likely to use the Coosa waterway fall entirely within the aforementioned 12-county impact zone. It is also likely that were the need intensive enough, Coosa waters could be transported as much as 25 or 30 miles and still be relatively economical. At some time in the future this might be the case for the Birmingham area, which lies to the north and west of the Coosa; but Birmingham's needs, as a result of commitments already made, are expected to be satisfied during the next half century primarily by water sources found to the north and northwest of that community. Direct use of the Coosa River as a sanitary outlet is expected to continue, as in the present, for urban or industrial users who are located fairly close to the waterway. Development of a Coosa navigation channel is not expected to increase the quantity of water available for processing and sanitary reasons.

Recreation benefits, which are already materializing and which can be expected to increase in the future as a result of prior development of the waterway and of expanding population and income in the area, are likely to be centered primarily in selected areas directly contiguous to the Coosa River. These selected areas include land along the shores of the various lakes created by the hydroelectric dams that have already been built on the Coosa and land in service-area communities that in all cases are in close proximity to the shores of these lakes. Such recreation areas pertain to the Weiss, H. Neely Henry, Logan Martin, Mitchell, and Jordan reservoirs, which occupy an extensive portion of the Coosa waterway. Thus, the direct recreation benefits can be expected to be found primarily within the 12 aforementioned counties.

Direct use of Coosa water in electric power generation is limited to sites directly on or adjoining the Coosa River. Moreover, optimum use of the Coosa waterway for hydroelectric power, primarily for peaking

purposes, will apparently be accomplished before the waterway might be open to navigation. This assumes further expansion of capacity at the Mitcheli installation during the 1970's. Use of Coosa water in steam generation now occurs in the Wilsonville and Gadsden communities, which are contiguous to the river. Additional steam-generation capacity that will serve the needs of expanded population and industry in and around the Coosa region, that will probably use Coosa water in the steam-generation phase, and that will therefore be located close to the river itself, could probably be expected sometime before 2030.

The power generated by these various Coosa River facilities serves the immediate 12-county area and, in addition, through a comprehensive grid, the needs of broad areas beyond these 12 counties, including part of metropolitan Birmingham or Jefferson County, which is one county removed from the Coosa River. A precise determination of the total area that benefits heavily from Coosa power is reportedly difficult to make and the contribution of this power to the economic growth of that area would be even more difficult to measure.

Thus, the delineation of the 12 counties as the primary Coosa impact area for electric power generation is accurate from the point of view of direct use of Coosa waters and conservative from the point of view of where the resulting power is used. However, no additional significant power-generation benefits are expected to arise from the development of a Coosa navigation system.

The 50-year flood zone of the Coosa River encompasses land that is entirely or generally contiguous to the waterway. To the extent that the system of dams on the waterway contributes to flood control, the direct benefits are necessarily restricted to lands directly contiguous to the river and can be credited to construction that is already completed or will be completed before the waterway might be open to navigation. It is unlikely that the 50-year flood zone will be altered materially in the foreseeable future or that the flood zone will, therefore, become the locale of any significant new high-density urban industrial use.

B. Growth Communities

The major part of the growth of population, employment, and economic activity that is indicated for the 12-county impact area is expected to occur in already existing urban communities and their environs. The more important urban growth communities or areas are expected to be: Montgomery, Alabama; Gadsden and Anniston, Alabama; the area immediately south of the urban part of Jefferson County in Shelby County; and Rome, Georgia. The Childersburg, Sylacauga, Talladega, Clanton, and Pell City communities in Alabama are also expected to expand. These urban communities or areas, however, are expected to become considerably more extensive by the year 2030 than they are today. The geographic development patterns these urban areas are expected to follow are depicted in Figure 2. A more detailed discussion of the methodology used in estimating the extent and direction of expansion of these communities is presented below in part IV of this report.

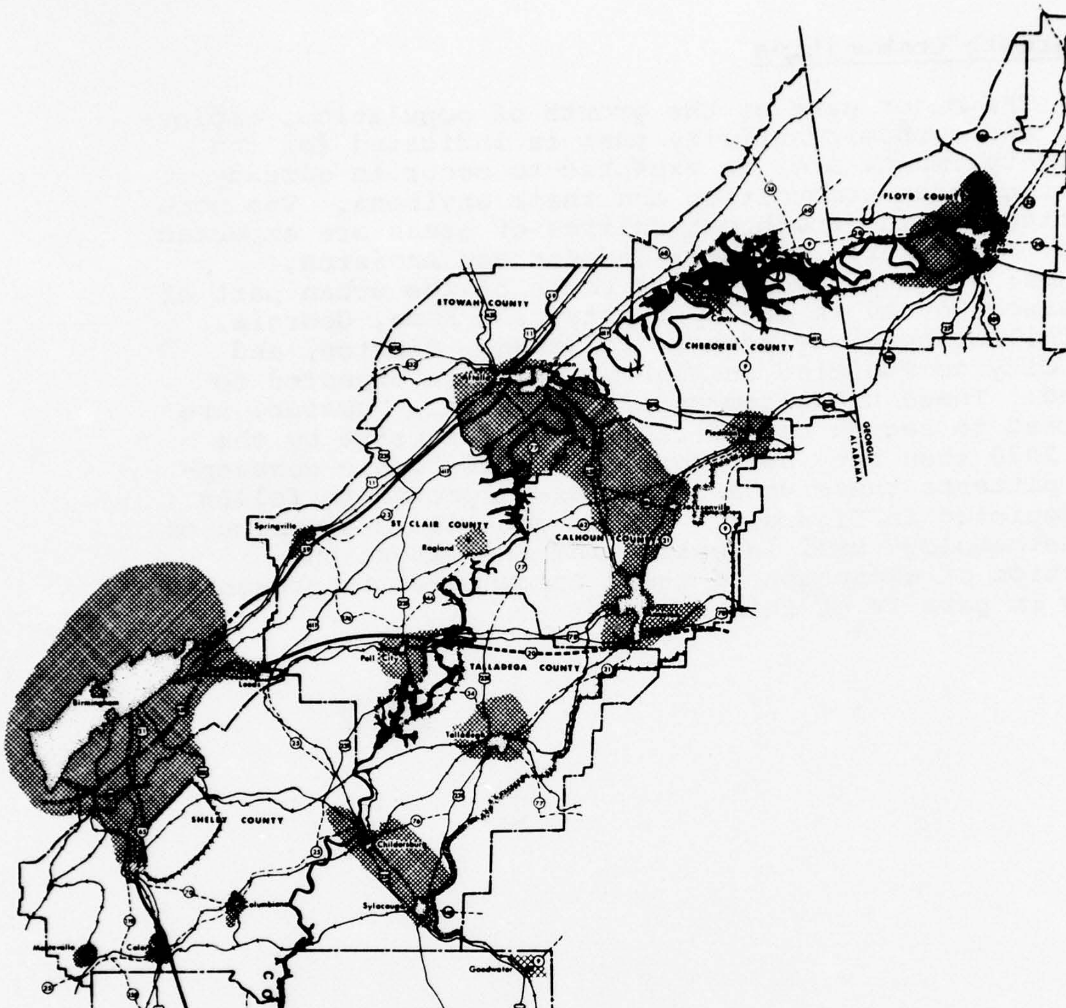

Figure 2

URBAN GROWTH AREAS

COOSA - ALABAMA RIVERS IMPACT AREA

MONTGOMERY, ALABAMA TO ROME, GEORGIA

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Scale

STATUTE MILES

Legend

STATE
CITY
STATE
URBAN AREAS TO 2030

III-9-124

10

III. BENCHMARKS AND NORMAL-GROWTH PATTERNS IN THE IMPACT COUNTIES

A. Benchmarks

Benchmarks are goal oriented concepts which have been developed as economic planning guides for Appalachia. Benchmark measures of population are based on the assumption that after 1980 local population will account for a constant percentage of the national population. Benchmark measures of employment reflect a number of assumptions: first, that local labor participation rates will increase to projected national rates by 2020; second, that unemployment will amount to 4% in the target years; third, that population-worker ratios will decline to 2.58 by 2020; and, last, that the area in question will attain an average per-capita income of at least 95% of the national average by 2020 (primarily as a result of changes in employment patterns).

If normal growth in an given area is expected to be less than benchmark, local development programs, such as a Coosa navigation project, can be assessed, in part, on the extent to which they can be expected to help close the gap between benchmark and normal-growth measures. The disaggregated normal-growth projections for the 12-county impact area were particularly useful in this study in helping to determine the amount of additional land that will be required for expanding population and employment.

The Office of Business Economics of the United States Department of Commerce, before the start of this study, had published benchmark projections of population and employment to the year 2020 for water subregions in Appalachia.[1] The Mobile District, Corps of Engineers

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[1] "Economic Base Study Information" (Exhibit 19 to Plan of Survey for Development of Water Resources in Appalachia), Office of Appalachian Studies, Corps of Engineers, Department of the Army, Cincinnati, January, 1967.

subsequently provided a disaggregation of these benchmark projections to the year 2020 for each of the 12 impact counties (as well as for other counties in the Coosa-Alabama River economic tributary area). Each of these projections was then extended to the year 2030, using the same rate of growth from 2020 to 2030 as was used from 2000 to 2020 (see Table I). The relative employment shares for each industrial sector in 2030 were maintained at the same level as in 2020, except in those employment series that were constant or declining in size, in which cases the absolute volume of employment was held constant to 2030.

B. Normal Growth

The Office of Business Economics also prepared projections of the normal growth of population and employment for the same water subregions in Appalachia extending to the year 2020. The Mobile District, Corps of Engineers disaggregated these values for each of the 12 impact counties, as it did for the benchmark values. Then, as in the case of the benchmark values, above, each of these projections was extended to the year 2030 using the same rate of growth from 2020 to 2030 as was used from 2000 to 2020 (see Table II). The relative employment shares for each industrial sector in 2030 were also maintained at the same level as in 2020, except in those employment series that were constant or declining in size. In those instances, the absolute volume of employment was also held constant to 2030.

C. County Growth Potentials

A comparison of normal-growth and benchmark projections indicates that none of the ten Appalachian counties in the 12-county study is expected to attain benchmark levels of employment and population by the year 2030. The other two counties, Autauga and Montgomery, are outside Appalachia and consequently did not have benchmark growth projections prepared for them, so that a direct comparison between normal and benchmark growth cannot be made. The data suggest, however, that the normal growth values for Montgomery may be below

Table I. Disaggregation of Benchmark Projections of Population and Employment to the 12-County Coosa River Impact Area, 1980-2030[a]

	Population				Employment			
	1980	2000	2020	2030	1980	2000	2020	2030
Autauga, Alabama	24,600	36,000	51,000	60,701	7,900	11,600	16,700	19,938
Calhoun, Alabama	134,900	188,600	266,900	317,505	52,478	79,254	114,550	137,695
Cherokee, Alabama	19,500	27,600	42,700	53,109	6,523	9,850	15,510	19,375
Chilton, Alabama	33,500	47,600	71,000	86,711	10,676	16,129	24,499	30,192
Coosa, Alabama	13,100	17,900	25,800	30,972	4,440	6,400	9,570	11,702
Elmore, Alabama	39,100	55,100	78,100	92,981	13,730	20,410	30,040	36,442
Etowah, Alabama	136,700	195,700	277,200	329,907	45,111	68,894	99,357	119,310
Montgomery, Alabama	219,000	276,000	354,000	401,666	83,800	106,000	136,200	154,387
Shelby, Alabama	43,700	62,400	90,900	109,704	14,201	21,584	32,003	38,969
St. Clair, Alabama	35,400	52,300	78,000	95,344	11,539	18,126	27,572	34,003
Talladega, Alabama	91,100	129,500	185,300	221,643	31,730	48,329	70,463	85,072
Floyd, Georgia	99,700	133,300	183,400	215,105	38,780	54,170	71,430	82,023
Total	890,300	1,222,000	1,704,300	2,015,348	320,908	460,746	647,894	769,108

[a] Data for the years 1980, 2000, and 2020 were developed by the Mobile District, Corps of Engineers. Data for 2030 were developed by Southern Research Institute.

Table II. Measures of Population and Employment, 1960, and Disaggregation of Normal Growth Projections of Population and Employment to the 12-County Coosa River Impact Area, 1980-2030[a]

	Population					Employment				
	1960	1980	2000	2020	2030	1960	1980	2000	2020	2030
Autauga, Alabama	18,739	24,600	36,000	51,000	60,701	5,915	7,900	11,600	16,700	19,938
Calhoun, Alabama	95,878	135,600	185,800	253,800	295,367	34,529	51,170	72,570	101,510	120,050
Cherokee, Alabama	16,303	19,500	26,700	39,900	48,774	5,099	6,354	8,964	13,654	16,850
Chilton, Alabama	25,693	33,400	45,900	66,200	79,497	7,680	10,374	14,674	21,564	26,140
Coosa, Alabama	10,726	12,800	16,300	21,000	23,836	3,550	4,300	5,600	7,530	8,732
Elmore, Alabama	30,524	39,800	52,100	69,800	80,790	10,473	13,730	18,600	25,840	30,039
Etowah, Alabama	96,980	136,300	189,300	259,000	302,932	29,915	43,821	62,691	87,511	103,387
Montgomery, Alabama	169,210	219,000	276,000	354,000	401,666	63,492	83,800	106,000	136,200	154,387
Shelby, Alabama	32,132	43,700	60,300	84,800	100,557	9,769	13,840	19,640	28,160	33,689
St. Clair, Alabama	25,388	35,400	50,500	72,900	87,582	7,740	11,224	16,494	24,284	29,464
Talladega, Alabama	65,495	90,900	125,700	173,600	203,997	21,245	30,818	43,938	61,988	73,626
Floyd, Georgia	69,130	88,000	120,200	170,800	203,596	26,249	33,860	46,950	68,030	81,014
Total	656,198	879,000	1,184,800	1,616,800	1,889,295	225,656	311,191	427,721	592,971	697,316

[a] Data for the years 1980, 2000, and 2020 were developed by the Mobile District, Corps of Engineers. Data for 2030 were developed by Southern Research Institute.

benchmark and that the normal growth values for Autauga may be at about benchmark, had benchmark values been established for those counties.

Also, although normal-growth estimates are fairly close to benchmark values for the year 1980 in most of the remaining 10 counties, care must be taken in accepting this as a firm conclusion since the procedure used for disaggregating the data was apparently suitable only for a first approximation. It is not likely, for example, that in the light of historic trends, normal growth of population and employment will reach or come close to benchmark values without the benefit of a major exogenous force in counties that are as rural as Cherokee, Chilton, and Coosa. Such an exogenous force in these counties might be unusually strong recreation and year-round residential development, or the location of a significant industrial complex—perhaps a paper and related chemical complex—that would use the ample quantities of suitable process water or other resources that are available along the waterway. Industrial development sites that are suitable for large-scale industrial expansion were found in these areas, but expanding recreation patterns may preclude industrial development on some of them at least.

For each of the 12 counties, a brief evaluation of its growth potentials may be found in the section entitled, "County Reports," which presents economic information on 36 counties in the region of the Alabama and Coosa Rivers between Montgomery, Alabama and Rome, Georgia.

Selected data from these reports are presented in Tables III and IV to point out certain characteristics and relative growth rates in the impact counties in recent years.

Table III. Selected Data, 12-County Coosa River Impact Area, 1960 and 1965

County	Population, 1965	Labor participation rate, 1965	Median age, 1960	Percent white, 1960	Median school years completed (age 25 and older), 1960	Percent male age 20-29, 1960	Percent age 18-64, 1960	Population density per sq. mile, 1960
Autauga, Alabama	22,801	21.3	24.3	57.8	9.1	4.9	47.9	31.3
Calhoun, Alabama	98,525	35.4	25.1	81.2	9.4	7.0	55.1	157.2
Cherokee, Alabama	16,306	23.1	26.6	89.6	8.3	6.2	52.5	27.2
Chilton, Alabama	25,252	23.3	28.0	84.1	8.2	5.5	51.4	36.8
Coosa, Alabama	11,058	22.7	27.0	63.8	8.3	5.0	49.4	16.5
Elmore, Alabama	33,779	n.a.	26.7	66.2	8.7	6.0	51.3	48.6
Etowah, Alabama	94,011	33.4	28.0	84.5	9.3	5.2	54.2	174.7
Montgomery, Alabama	170,644	45.2	25.8	61.7	11.2	6.8	54.1	214.2
Shelby, Alabama	34,934	23.1	24.8	81.1	8.6	6.1	52.4	40.2
St. Clair, Alabama	26,548	18.8	26.4	83.2	8.0	5.8	51.7	39.6
Talladega, Alabama	68,499	34.9	24.0	68.0	8.9	5.4	50.9	87.3
Floyd, Georgia	71,436	39.6	28.4	85.6	8.8	6.0	56.3	134.5
State								
Alabama	-	34.0	26.0	69.9	9.1	7.3	52.5	64.0
Georgia	-	37.5	25.9	71.4	9.0	6.5	53.7	67.7
Nation	-	39.0	29.5	88.6	10.6	5.9	55.0	50.5

Table IV. County Growth Rates Compared to State, 12-County Coosa River Impact Area

County	Population, 1960-1965	Labor force, 1960-1965	Personal income, 1960-1965	Per-capita income, 1960-1965	Demand deposits, 1960-1964	Time deposits, 1960-1964
Autauga, Alabama	higher	lower	higher	lower	higher	higher
Calhoun, Alabama	lower	(declined)	lower	higher	higher	lower
Cherokee, Alabama	(no change)	(declined)	lower	lower	lower	lower
Chilton, Alabama	(declined)	lower	lower	lower	higher	lower
Coosa, Alabama	lower	(declined)	higher	higher	lower	lower
Elmore, Alabama	higher	n.a.	higher	higher	lower	lower
Etowah, Alabama	(declined)	(declined)	lower	higher	lower	lower
Montgomery,Alabama	lower	higher	higher	higher	higher	lower
Shelby, Alabama	higher	higher	higher	higher	higher	lower
St. Clair, Alabama	lower	(declined)	higher	higher	higher	higher
Talladega, Alabama	lower	lower	higher	higher	lower	lower
Floyd, Georgia	lower	lower	lower	lower	lower	lower

IV. WATER-ORIENTED INDUSTRIAL SITES

This phase of the study was concerned with the identification and evaluation of potential water-oriented industrial sites along the Alabama and Coosa Rivers, extending from the vicinity of Montgomery, Alabama to Rome, Georgia.

A. Purpose

The overall purpose of this evaluation was to determine whether the normal economic growth that is anticipated for the 12-county Coosa River impact area will be restrained by an insufficiency of land suitable for the type of industry, particularly water-oriented industry, expected to expand according to normal growth. The specific objectives of this section were to identify and evaluate land areas that are suitable for the location of new industrial plants which require large amounts of water as an inherent part of their processing methods, or which require access to a navigable stream for the economical receipt or dispatch of freight.

Requirements for water-oriented industrial land were considered for the time period that extends to the year 2030, which is regarded as the normal life span of the Coosa navigation project that is under review. Demand for land was based on a density coefficient of 7 workers/acre for water-oriented industries as explained below in part V. Estimates of the demand for land were based on increases in employment due to normal and benchmark growth. Because such a long-range perspective has been used, a rather broad definition of potential usability was assumed. Selection of sites considered suitable for use by water-oriented industry during the projection period to 2030 was based on a number of general criteria as outlined below.

B. Site-Evaluation Criteria

Specific criteria were established for evaluating the advantages and disadvantages of specific land areas selected as potential water-oriented industrial sites. All land within the impact area, either adjoining or

within two miles of the Alabama and Coosa Rivers extending from the vicinity of Montgomery, Alabama and extending to the vicinity of Rome, Georgia was examined according to these criteria: acreage, dimensions, slope, proximity to the river, extent of development and cost of land, flooding, presence of derelict land, availability of electrical power, availability of rail and highway transportation, proximity to urban support areas, absence of recreational encroachment, and land-ownership patterns.

1. Acreage

Only those sites were selected that generally contained a minimum of about 400 acres. Site acreage was determined by planimeter measurements. Although a single industrial facility may occupy 400 acres or more, most industrial facilities occupy less. This minimum-size site can normally be subdivided into at least two separate parcels.

2. Dimensions

A minimum size of about 2000 linear feet in width or depth was generally adhered to in selection of sites. This dimension was considered to be a desirable minimum for subdividing the site. In some cases, the shoreline formed a peninsula that had less than 2000 feet. In other cases, topographic barriers caused the usable portions of a site to have less than 2000 feet in width or depth. In all such cases, a minimum dimension of 1000 feet was adhered to. Sites were also generally selected on the basis of one dimension not being greater than twice its transverse dimension (length not greater than twice the width); this proportion was considered to be a desirable maximum for subdividing and for efficiency of site utilization.

3. Slope

Sites were normally restricted to those that generally have a natural slope of 5% or less. This slope was considered to be the maximum that is acceptable for efficiency in land utilization for structures, foundations, and roadway gradients.

4. Proximity to the river

Leading water-processing and barge-using industries, such as those considered in this study, generally require direct access to water frontage. A distance of one to two miles was assumed to be the maximum allowable to water frontage from inland sites. Potential sites were therefore restricted to those that are approximately two miles or less from the river.

5. Extent of development and cost of land

Only those land areas that were predominantly vacant or rural at the time of the analysis were considered. The extent of development was determined with the help of detailed geodetic survey maps, aerial inspection, and aerial photography.

Prospective sites that were located within existing or developing commercial areas or residential zones, even though vacant, were considered to be too high in cost to be feasible for large-scale industrial acquisition and development. These areas were therefore eliminated from consideration.

6. Flooding

All land adjacent to the Coosa and Alabama Rivers within the study area was examined for susceptibility to 50-year floods, and land subject to recurrent flooding in intervals of 50 years or less was eliminated from consideration. Information on 50-year flooding was obtained from the Corps of Engineers and the Alabama Power Company and was transposed to detailed United States Geodetic Survey and Army maps having contour intervals of 20 feet.

7. Presence of derelict land

Land considered to be derelict was generally eliminated from consideration, though it was not feasible to avoid inclusion of all derelict land. In general, selected sites have less than 10% of this type of land. Derelict land is that which is considered to be costly to prepare or improve and includes:

a. Areas subject to intermittent localized flooding, tributary-stream meander belts, marshland, swamps, intermittent wash areas, and other land subject to action by water of sufficient severity or intensity to render such land unsound for permanent structures or buildings.

b. Quarries, strip-mines, open-pit mines, undermined areas, geologic-fault areas, structurally unsound land, recently used sanitary land-fill areas, slag dumps, and mine-tailing areas.

c. Land not feasible for development due to other physical or economic reasons, for example, small areas of usable land isolated by large areas of derelict land and usable land made inaccessible by topography or floods.

8. Availability of electrical power

Electrical power was considered to be required for all sites. Availability of power was assumed wherever rights-of-way could be tied to existing or future roadways, and wherever there were existing easements for high-tension transmission lines. Power availability was evaluated only on the basis of existing modes of transmission and distribution. No attempt was made to define the carrying capacity of existing or anticipated transmission facilities. In this respect it was assumed that if the present capacity of existing transmission facilities is not adequate for industrial needs, this capacity could be increased to meet future demands.

9. Availability of rail and highway transportation

Availability of rail and highway transportation was considered to be a prime requirement in the selection of potential sites. Air transportation was not considered to be critical. Access to water transportation was of course assumed and therefore was not evaluated. Although access to rail transportation was viewed as an extremely important requirement for all sites, it was not considered to be sufficiently critical to exclude some sites which were otherwise considered

good. For example, sites larger than 1000 acres were considered to have feasible access if within 1-1/2 to 2 miles of existing rail facilities. Sites smaller than approximately 600 acres were generally not considered to have feasible access if more than 1/2 to 1 mile from an existing railway.

A distance of two miles was considered to be the maximum allowable to an existing, planned, or likely future major road. Prospective sites that are farther than two miles from such a roadway were generally excluded from further consideration.

Consideration was also given to the question of access to future railway lines or roadways. Sites that are denied such access because of floodlands, marshlands, rough terrain, and ridge barriers were eliminated from further evaluation.

10. Proximity to urban support areas

Proximity to urban support land was also included in the site criteria. Support land in this context refers to land that is suitable for residential and related uses for the labor that may be employed on a site. The bulk of such support land is expected to be urban in character. Accessibility from a prospective site to support land was viewed from a time-distance relationship. Initially one hour was used as a critical maximum. Subsequent analysis revealed, however, that no site within the impact area was more than 45 minutes from an existing or projected support area.

11. Absence of recreational encroachment

Prospective sites that were located within existing or developing recreation areas were generally excluded from consideration.

12. Land-ownership patterns

To the extent that information on land ownership was readily available, prospective sites that were located in areas comprising many small parcels under separate ownership were generally excluded from consideration. Sites for which ownership patterns were

available were those that are generally adjacent to or near the Coosa River. This information was obtained from maps supplied by the Alabama Power Company.

C. Site Supply and Demand

The evaluation of prospective sites was carried out primarily with the help of maps of the United States Geodetic Survey, the United States Army, the Alabama Power Company, and the Alabama State Highway Department. In addition, most prospective sites were surveyed from the air by helicopter at elevations ranging from 500 feet to 4000 feet. Photographs (35-mm slides) were taken at altitudes which, in the judgment of the evaluation team, best indicated the character of the site and surrounding land. Photographs were also taken of adjacent and nearby urban areas, related urban-corridor areas, and developing suburban areas, for later analysis. Observation data on prospective sites were also recorded, insofar as possible under flight conditions, according to a detailed format.

A total of 78 potential industrial sites on or near the banks of the Alabama and Coosa Rivers between Montgomery and Rome were identified and evaluated (see Figure 3). Of these, 37 were eliminated for a variety of reasons as indicated in the detailed site analysis presented in Table V.

The remaining 41 sites were considered suitable for use by water-using or barge-oriented plants. (Maps describing these sites are presented in Appendix A.) The acreage of these sites constitutes the supply of water-oriented industrial land in the Coosa River impact area and is summarized in Table VI.

Estimates were also prepared of the amount of water-oriented industrial land needed in each county of the Coosa River impact area to the year 2030. These estimates of land requirements or demand were based, first, on increases in normal-growth employment expected to materialize between 1960 and 2030, and, second, on additional increases in benchmark-growth employment expected to materialize during the same period. These estimates constitute the demand for water-oriented

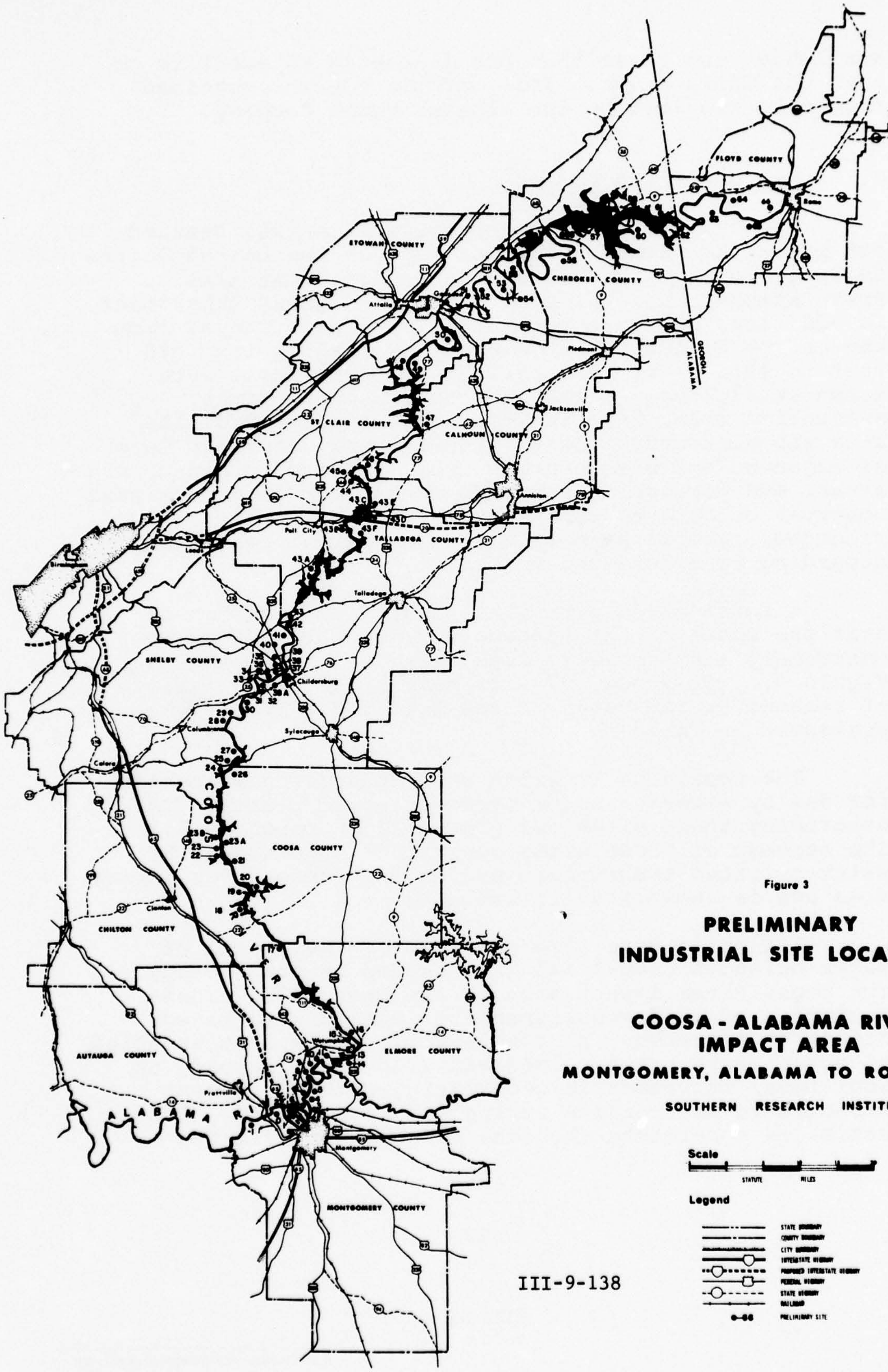

Figure 3

PRELIMINARY INDUSTRIAL SITE LOCATIONS

COOSA - ALABAMA RIVERS IMPACT AREA

MONTGOMERY, ALABAMA TO ROME, GEORGIA

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Table V, A-1. Analysis of Industrial Sites Along the Coosa and Alabama Rivers Between Montgomery, Alabama and Rome, Georgia

County Site No.	Acres (approx)	Nearest city	Proximity to city (miles)				River frontage			Railroad access			Highway access			Slope			50-year Flooding			Marshland			Derelict land		
			1 - 5	5 - 10	10 - 15	15+	Substantial	Limited	None	On site	Near site	None	On site	Near site	None	0 - 5%	5 - 10%	10%+	Substantial	Limited	None	Substantial	Limited	None	Substantial	Limited	None
Montgomery																											
Site No. -1	-	Prattville Montgomery	x x				x			x			x			x			x			x			x		
0	-	Montgomery	x				x			x			x			x			x				x			x	
2	-	Montgomery	x				x			x			x			x				x			x		x		
3	1040	Montgomery	x				x			x			x			x					x			x			x
4	-	Montgomery	x				x				x		x			x			x			x				x	
5	-	Montgomery	x						x		x		x			x			x					x			x
Elmore																											
1	-	Montgomery	x				x					x	x			x			x			x					x
6	-	Montgomery	x				x			x			x			x			x				x				x
7	655	Montgomery	x					x		x				x		x				x			x				x
8	720	Montgomery	x					x			x		x			x				x			x				x
9	1125	Wetumpka		x				x		x			x			x					x		x				x
10	1485	Wetumpka	x				x				x		x			x					x			x			x
11	1305	Wetumpka	x				x				x		x			x					x			x			x
12	820	Wetumpka	x						x	x			x			x					x			x			x
13	485	Wetumpka	x					x			x		x			x					x			x			x
14	2150	Wetumpka	x					x				x	x			x								x			x
15	-	Wetumpka	x				x				x		x			x			x					x			x
16	1640	Wetumpka	x				x					x	x				x				x			x			x
17	-	Clanton			x		x					x		x		x					x			x			x
Chilton																											
18	-	Clanton		x			x				x			x			x				x			x			x
19	-	Clanton	x				x					x	x			x					x			x			x
22	-	Clanton	x				x					x		x		x					x			x			x
23	-	Clanton	x				x					x		x		x					x			x			x
23B	-	Clanton		x			x					x	x			x					x			x			x
Coosa																											
20	-	Clanton			x		x					x	x				x				x			x			x
21	-	Clanton				x	x					x	x			x				x			x				x
23A	-	Sylacauga				x	x					x		x		x					x			x			x
26	-	Tall. Sprgs Columbiana Sylacauga	x	x	x				x			x	x			x					x		x				x

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Table V, A-2. Analysis of Industrial Sites Along the Coosa and Alabama Rivers Between Montgomery, Alabama and Rome, Georgia

County Site No.	Vegetative cover						Power availability					Land development				Suitability for development		
	Trees	Scrub	Grass	Heavy	Medium	Light	Local dist.	High voltage	On site	Near site	None	Substantial	Medium	Light	None	Yes	No	Comments
Montgomery																		
Site No. -1	x				x		x		x					x			x	Subject to extensive flooding
0	x					x	x	x	x					x			x	Subject to extensive flooding; close to Maxwell Field approaches
2	x				x		x		x					x			x	Subject to extensive flooding
3	x				x		x	x	x					x		x		Possible urban encroachment
4	x					x		x	x						x		x	Subject to extensive flooding
5	x					x		x	x						x		x	Subject to extensive flooding; poor river access
Elmore																		
1	x					x	x	x	x					x			x	Subject to extensive flooding; no rail access
6	x				x			x	x						x		x	Subject to extensive flooding
7	x				x		x			x					x	x		Subject to limited flooding
8	x					x	x			x				x		x		Needs improved roads
9	x					x	x		x					x		x		Partially developed; numerous streams; some flooding
10	x					x	x		x					x		x		
11	x					x	x		x					x		x		Rail within 1/2 mile
12	x					x	x	x	x					x		x		Inland site, 1 mile from river
13	x				x			x	x					x		x		
14	x					x		x	x					x		x		About 7 miles to rail
15	x					x	x		x					x			x	Subject to extensive flooding
16	x					x	x		x				x			x		Needs grading, about 5 miles to rail
17	x				x		x			x					x		x	Good site; too far from rail
Chilton																		
18	x			x						x					x		x	Too far from transportation; needs grading & clearing
19	x			x			x		x						x		x	No rail access; needs clearing
22	x			x				x	x						x		x	Needs clearing
23	x			x				x		x					x		x	Too far from transportation; needs clearing
23B	x			x				x	x					x			x	Residential and recreational use already developing
Coosa																		
20	x			x			x		x						x		x	No rail access; needs grading and clearing
21	x				x		x		x					x			x	No rail access
23A	x			x				x		x				x			x	Adjoins Lay Dam; has air strip; recreational use developing
26	x			x			x		x					x			x	No river access; 3 miles to rail

Table V, B-1. Analysis of Industrial Sites Along the Coosa and Alabama Rivers Between Montgomery, Alabama and Rome, Georgia

			Proximity to city (miles)				River frontage			Railroad access			Highway access			Slope			50-year Flooding			Marshland			Derelict land		
County Site No.	Acres (approx)	Nearest city	1 - 5	5 - 10	10 - 15	15+	Substantial	Limited	None	On site	Near site	None	On site	Near site	None	0 - 5%	5 - 10%	10%+	Substantial	Limited	None	Substantial	Limited	None	Substantial	Limited	None
Shelby																											
Site No. 24	-	Shelby Columbiana	x	x					x		x		x			x				x			x				x
25	640	Shelby Columbiana	x	x			x			x			x			x				x			x				x
27	-	Columbiana		x				x			x			x		x					x			x			x
28	3070	Columbiana		x				x		x			x			x				x			x				x
29	1000	Columbiana		x				x		x			x			x					x		x				x
33	700	Childersburg	x					x				x	x			x					x			x			x
34	600	Childersburg	x						x			x	x			x					x		x				x
35	590	Childersburg	x						x			x	x			x					x			x			x
36	655	Childersburg	x				x					x		x		x					x			x		x	
37	195	Childersburg		x				x			x		x				x				x			x			x
38	1305	Childersburg	x					x			x		x			x					x			x			x
39	945	Childersburg	x					x			x		x			x					x		x				x
40	345	Childersburg	x					x				x	x			x					x			x			x
41	1575	Childersburg		x				x		x			x			x					x			x			x
Talladega																											
30	-	Childersburg		x			x					x		x		x					x			x			x
31	545	Childersburg	x					x		x			x			x					x			x			x
32	660	Childersburg	x					x		x			x			x					x			x			x
38A	-	Childersburg	x					x		x			x			x					x			x			x
42	890	Childersburg		x				x		x			x			x					x			x			x
43	925	Childersburg		x				x		x			x			x					x			x			x
43C	330	Pell City		x				x		x			x			x					x			x			x
43D	495	Pell City		x					x	x			x			x					x			x			x
43E	870	Pell City		x				x		x			x			x					x			x			x
43F	700	Pell City		x					x			x	x			x					x			x			x
St. Clair																											
43A	-	Pell City		x			x					x	x			x					x			x			x
43B	765	Pell City	x					x		x			x			x					x			x			x
44	-	Pell City		x			x					x			x	x					x			x			x
45	-	Pell City		x				x				x	x			x					x			x			x
46	440	Ragland	x						x			x	x				x				x			x			x

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Table V, B-2. Analysis of Industrial Sites Along the Coosa and Alabama Rivers Between Montgomery, Alabama and Rome, Georgia

County Site No.	Vegetative cover: Trees	Scrub	Grass	Heavy	Medium	Light	Power availability: Local dist.	High voltage	On site	Near site	None	Land development: Substantial	Medium	Light	None	Suitability for development: Yes	No	Comments
Shelby																		
Site No. 24	x			x			x		x						x		x	No river access; 3 miles to rail
25	x				x		x		x					x		x		Possible non-industrial encroachment
27	x			x			x		x					x			x	Too isolated and small
28	x					x	x		x					x		x		Needs rail spur; some development
29	x					x	x		z						x	x		
33			x	x			x		x						x	x		Good road; poor river access; 5 miles to rail
34			x	x			x		x					x		x		Good road; poor river access; 4 miles to rail
35	x					x	x		x				x			x		Good road; poor river access; 3 miles to rail
36	x			x			x		x					x		x		Good road; poor river access; 3 miles to rail
37	x					x		x	x					x		x		Small; good roads; 1 mile to rail; may need grading
38	x					x		x	x					x		x		Rail short distance
39	x					x		x	x					x		x		Sewage treatment plant now on river
40	x					x		x	x					x		x		3 miles to river; good rail access
41	x					x		x	x					x		x		
Talladega																		
30			x			x				x				x			x	Small; isolated; poor roads
31	x					x				x					x	x		
32	x					x	x		x					x		x		Some river frontage
38A	x					x		x	x					x			x	Too small; otherwise satisfactory
42	x					x	x		x				x			x		Excellent rail access; development may be excessive
43	x					x	x		x					x		x		Excellent rail and good river access
43C	x					x	x		x					x		x		Flood & recreation land along river; excellent rail access
43D	x					x	x		x					x		x		1 mile to river
43E	x					x	x		x					x		x		1 mile to river
43F	x					x		x	x					x		x		On creek; 3 miles to river
St. Clair																		
43A	x					x	x		x					x			x	7 miles to rail
43B	x					x		x	x					x		x		Recreational & residential uses developing in area
44	x					x					x				x		x	Good site, but isolated
45	x				x	x		x						x			x	Too small; isolated
46	x				x		x		x					x		x		4 miles to rail

Table V, C-1. Analysis of Industrial Sites Along the Coosa and Alabama Rivers Between Montgomery, Alabama and Rome, Georgia

County Site No.		Acres (approx)	Nearest city	Proximity to city (miles)				River frontage			Railroad access			Highway access			Slope			50-year Flooding			Marshland			Derelict land		
				1 - 5	5 - 10	10 - 15	15+	Substantial	Limited	None	On site	Near site	None	On site	Near site	None	0 - 5%	5 - 10%	10%+	Substantial	Limited	None	Substantial	Limited	None	Substantial	Limited	None
Calhoun																												
Site No.	47	805	Anniston			x		x			x			x				x				x			x			x
Etowah																												
	48	1540	Gadsden		x			x					x	x			x					x			x			x
	49	-	Gadsden		x				x				x	x			x					x			x			x
	50	775	Gadsden	x					x				x	x			x					x			x			x
	51	5320	Gadsden	x				x			x			x			x					x			x			x
	52	-	Gadsden		x			x				x		x			x					x			x			x
	53	-	Gadsden			x		x			x			x			x				x			x				x
	54	-	Gadsden		x			x					x	x			x				x			x				x
	55	-	Centre			x		x					x	x			x				x				x			x
	55A	3785	Centre			x		x			x			x			x				x				x			x
Cherokee																												
	56	-	Centre	x				x					x	x			x					x			x			x
	57	-	Centre	x				x					x	x			x					x			x			x
	58	-	Centre	x				x					x	x			x					x			x			x
	59	-	Centre		x			x			x			x			x					x			x			x
	60	-	Centre		x			x					x	x			x					x			x			x
	61	5730	Centre			x		x			x			x			x				x			x				x
	62	-	Rome			x		x					x	x			x				x				x			x
Floyd																												
	63	5600	Rome		x			x					x	x			x							x				x
	64	5935	Rome		x			x			x			x			x							x				x
	65	3200	Rome		x			x			x			x			x					x			x			x
	66	-	Rome		x			x					x	x			x					x			x			x

Table V, C-2. Analysis of Industrial Sites Along the Coosa and Alabama Rivers Between Montgomery, Alabama and Rome, Georgia

County Site No.	Vegetative cover: Trees	Scrub	Grass	Heavy	Medium	Light	Power availability: Local dist.	High voltage	On site	Near site	None	Land development: Substantial	Medium	Light	None	Suitability for development: Yes	No	Comments
Calhoun																		
Site No. 47	x			x			x		x					x		x		Site may be committed; heavy tree cover; bisected by rail
Etowah																		
48	x				x		x		x					x		x		Excellent river frontage; no rail access
49	x					x	x		x					x			x	Residential development; no rail
50	x					x	x		x					x		x		Residential development; no rail
51	x					x	x		x					x		x		Needs road improvements
52	x					x	x		x					x			x	Needs bridge for rail access
53	x					x	x		x					x			x	Large site: some industrial potential
54	x				x		x		x					x			x	Poor access
55	x				x		x		x					x			x	Poor access
55A	x				x		x		x					x		x		Isolated, but suitable site
Cherokee																		
56	x				x		x		x					x			x	Isolated
57	x					x	x		x					x			x	Isolated; recreation development
58	x				x		x		x				x				x	Recreation development
59	x			x			x		x					x			x	Recreation development
60	x				x		x		x					x			x	Recreation development
61	x				x		x		x					x		x		
62	x					x	x		x					x			x	No rail access
Floyd																		
63			x	x			x		x						x	x		Needs bridge to rail; recreation development
64	x					x	x		x					x		x		
65	x				x		x		x					x		x		
66	x					x	x		x					x			x	3 miles to rail; residential development

Table VI. Acreage of Potentially Suitable Water-Oriented Industrial Sites, by County, Coosa River Impact Area

County	Site Number	Site acreage: Site	Site acreage: County total
Alabama			
Calhoun	47	803	803
Cherokee	61	5,729	5,729
Elmore	7	655	
	8	718	
	9	1,126	
	10	1,485	
	11	1,306	
	12	819	
	13	486	
	14	2,150	
	16	1,638	10,383
Etowah	48	1,539	
	50	773	
	51	5,320	
	55-A	3,785	11,417
Montgomery	3	1,040	1,040
Shelby	25	640	
	28	3,072	
	29	998	
	33	699	
	34	599	
	35	588	
	36	655	
	37	196[a]	
	38	1,306	
	39	944	
	40	344[a]	
	41	1,573	11,614
St. Clair	43-B	766	
	46	440	1,206
Talladega	31	543	
	32	662	
	42	892	
	42	925	
	43-C	329[a]	
	43-D	496	
	43-E	870	
	43-F	699	5,416
Georgia			
Floyd	63	5,600	
	64	5,933	
	65	3,200	14,733
Total	(41 sites)		62,341

[a] Although these sites have less than 400 acres, they were included in the tabulation because they are contiguous to other large sites with which they can be combined or for which they can provide improved river access.

industrial land. A comparison of supply and demand by county is presented in Table VII.

For the impact area as a whole, the supply of water-oriented industrial land amounts to about 62,340 acres and far exceeds the estimated demand of about 2,285 acres. However, in three counties, some demand for water-oriented land is anticipated, but there are no suitable sites available within the county boundaries; this disparity is not expected to create any problems for the reasons indicated below.

In Autauga County, Alabama, demand for 104 acres of water-oriented industrial land is anticipated by 2030. There are no available suitable sites in this county, largely because of poor terrain, flooding, and prior development. Most of the growth is expected to occur in the southern part of the county between Prattville and Montgomery. This area has good access via Interstate 65 and U.S. 31 to river sites in Montgomery County, which has an excess of supply over anticipated demand for such land.

A modest demand for 30 acres of waterfront industrial land is expected by 2030 in Chilton County, Alabama. There are no suitable sites in Chilton County, however. The nearest sites are in Shelby County, Alabama, where supply is expected to be considerably greater than demand. These sites in Shelby County can be reached by State Route 25 and are a distance of about 20 miles from the interchange of Route 25 and I-65 near Calera. In Chilton County, most of the anticipated development is expected to occur around Clanton and north to the county line in the I-65 corridor. Labor from this area for the sites in Shelby County would have to travel between five to twenty miles on I-65 to reach State Route 25 and the maximum travel time involved would be about 45 to 60 minutes, which is not considered unreasonable. It is therefore expected that the demand for water-oriented land that is generated within Chilton County, Alabama, can be met by sites in Shelby County, Alabama.

Table VII. Estimated Demand for and Supply of Water-Oriented Industrial Land in the Coosa River Impact Area by 2030 (in acres)

County	Estimated demands: Normal growth	Estimated demands: Additional for growth to benchmark	Estimated demands: Total	Estimated supply
Alabama				
Autauga	104	-	104	-
Calhoun	-	140	140	803
Cherokee	90	28	118	5,729
Chilton	30	18	48	-
Coosa	140	15	155	-
Elmore	240	(-87)	240	10,383
Etowah	-	167	167	11,417
Montgomery	70	-	70	1,040
Shelby	250	71	321	11,614
St. Clair	90	59	149	1,206
Talladega	640	263	903	5,416
Georgia				
Floyd	630	(-650)	630	14,733
Total	2,284	761	3,045	62,341

Overall, the amount of available land that is suitable for use by water-oriented industry in the 12-county impact area far exceeds the amount that future growth is expected to require. Estimates of the expected demand were based on an assumed employment density of 7 workers per acre. Even if this assumption proves to be too high and actual densities are as low as one worker per acre, the resulting overall normal-growth demand of 16,000 acres would still be about one-fourth of the potential supply. It appears, therefore, that the amount of available riverfront land is more than adequate to accommodate both normal and benchmark growth anticipated in the impact area by the year 2030.

V. GENERAL DEMAND FOR AND SUPPLY OF LAND IN THE COOSA RIVER IMPACT AREA

A. Purpose

An analysis was carried out of the projected demand for and supply of land for all purposes in the Coosa River impact area. The objective of this analysis was to determine whether the available land is sufficient to support a diverse growth pattern or is insufficient and therefore likely to serve as a constraint on economic growth in the area.

The basic inputs for this phase of the study were data on increases in normal and benchmark growth of employment in water-oriented and all other industries and in population in each of the 12 counties within the impact area.

The specific objectives of this part of the study were, first, to translate these estimates of increases in employment and population into estimates of the amount of land that will be necessary to accommodate these increases, and second, to evaluate land needs of general industry (primarily non-water oriented) and population in relation to the possible location of future development in each county and to the amount of land actually available for these purposes. Thus, it would be possible to determine whether there will be a sufficient quantity of suitable land to accommodate growth and to recognize the nature of any constraints that may be imposed because of a lack of land.

B. General Procedure

The following general procedure was used in this phase of the study:

1. Anticipated employment- and population-density coefficients (workers and population per acre) were established.

2. The employment-density coefficients were applied to the projected increases in employment to develop estimates of riverside and other industrial, trade, and service acreage likely to be required.

3. The projected population increase was divided into rural and urban segments and the population-density coefficient was applied to the increase in urban population to derive an estimate of all nonmanufacturing land-use requirements.

4. The estimates were combined to produce a measure of total land requirements for projected growth and then reviewed on a county-by-county basis for reasonableness.

5. Each county was then reviewed individually in relation to its population growth trends, highway and railroad system, and topography to determine where growth most likely will occur.

6. The potential growth areas were then delineated on suitable maps and analyzed to insure that sufficient land was available within the 12 impact counties to accommodate the increases anticipated in population and employment.

Each of these steps is discussed below.

C. Density Coefficients

Three density coefficients were developed to convert estimates of increases in employment into estimates of land requirements. One coefficient was developed for water-oriented manufacturing employment, another for all other manufacturing, and a third for trade, service, and related activities. These are the three major employment categories that generate a demand for urban land. Employment in agriculture and mining is directly resource related and the resource is some form of land. Most land of this type is often located outside of urban areas and is generally not suitable for other uses. Employment in transportation, communications, and utilities cannot be reduced to a meaningful density coefficient because of the wide variety of operations contained in these

activities and because little of the land used for these purposes generates any direct employment at all. An allowance for this category, however, was included in a gross population-density coefficient.

1. Manufacturing densities

Several data sources were used to develop a density coefficient for manufacturing employment.

A recent report of the Spindletop Research Institute[2] provided employment densities for a number of manufacturing categories that were culled from a variety of sources. These densities are summarized in Table VIII. The highest average densities were in textiles and apparel; excluding these categories, densities varied from 5 to 25 workers per acre. The overall average, including the textiles and apparel industries, was 18 workers per acre and the average, excluding these two categories, was 14.

A second source was a study of industrial employment densities undertaken in the Birmingham urban area.[3] This study showed that in the Birmingham area manufacturing industries which have intensive land-use patterns averaged 58 workers per acre; those industries representing intermediate intensities of land use averaged 19 workers per acre; and those which tended to have large extensive sites averaged about 6 workers per acre. The results of this survey are shown in Table IX. These data are, of course, based on existing conditions in a highly developed and old established manufacturing center and many of the industrial plants are not representative of more recent trends and densities.

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[2] Table 62, Expansion Benefits Analysis for the Salyersville-Royalton Area, prepared for the Office of Appalachian Studies of the U. S. Corps of Engineers by Spindletop Research Center, Lexington, March, 1967.

[3] Development Standards, Birmingham-Jefferson County Regional Planning Commission, Birmingham, September, 1966.

Table VIII. Average Manufacturing Employment Densities, Salyersville-Royalton Area, Kentucky[a]

Standard Industrial Classification		Average number of employees per net acre
20	Food and kindred products	10
22	Textile mill products	45
23	Apparel and finished products	40
26	Paper and allied products	10
28	Chemicals and allied products	9
30	Rubber and miscellaneous plastics	16
33	Primary metals	11
24	Lumber and wood products	10
25	Furniture and fixtures	8
27	Printing, publishing, etc.	5
31	Leather and leather products	19
32	Stone, clay and glass products	8
34	Fabricated metal, excluding machinery	17
35	Machinery, except electrical	19
36	Electrical machinery	19
37	Transportation equipment	14
39	Miscellaneous manufacturing	25
	Overall agerage, including 22, 23	18
	Overall average, excluding 22, 23	14

[a] Source: Table 62, Expansion Benefits Analysis for the Salyersville-Royalton Area, prepared for the Office of Appalachian Studies of the U. S. Corps of Engineeers by Spindletop Research Center, Lexington, March, 1967.

Table IX. Classification of Industry by Type and Employment Density, Birmingham, Alabama, 1965[a]

Standard Industrial Classification		No. of firms in sample	Average no. of workers per acre
Intensive (over 50 workers per acre)			
21	Food and kindred products	13	55.2
343	Electrical machinery	5	62.9
	Total workers per acre	18	
	Average no. of workers per acre		57.9
Intermediate (11 to 50 workers per acre)			
22-23	Textiles and apparel	4	18.6
24-25	Lumber and furniture	7	13.8
26-27	Paper and printing	4	15.1
342	Nonelectrical machinery	4	32.5
344	Transportation equipment manufacturing	3	20.2
349	Other fabricated metals	11	20.8
42	Motor vehicle transportation	3	15.8
51	Wholesaling and warehousing	5	40.2
	Total workers per acre	41	
	Average no. of workers per acre		18.9
Extensive (1 to 10 workers per acre)			
28	Chemicals	3	1.0
32	Stone, clay, and glass	6	7.0
33	Primary metals[b]	7	11.3
	Total workers per acre	16	
	Average no. of workers per acre		6.4
Grand total		75	
Grand average			24.2

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[a] Source: Sample Survey of Birmingham Area Industries, Birmingham-Jefferson County Regional Planning Commission, 1966.

[b] Described as extensive because of requirements for large amounts of land considered incidental to production.

Additional data from field surveys and other records of the Birmingham-Jefferson County Regional Planning Commission were used to review some of the local geographical differences which appear in employment densities and which can be related to more recent trends in industrial development in the Birmingham area. These data are shown in Table X, both for the manufacturing and the trade and service categories.

In manufacturing categories the average density in the inner parts of the urban area, which comprise most of the original industrial settlements and the development that had taken place through 1950, was about 12 workers per acre and ranged as high as 22 workers per acre. In the outer areas, which are the sections where most of the post-war development has occurred, the densities were much lower. They averaged about 3 workers per acre and in no sector was it higher than 6 workers per acre.

A third source of information was found in a recent publication of the Economic Development Administration of the United States Department of Commerce.[4] A summary of the employment densities contained in this report is shown in Table XI. Apart from apparel firms, of which only two were included in the report and for which densities were extremely high, the average densities ranged between 7 and 14.

It is generally recognized that employment densities have been declining fairly consistently in the more recently constructed plants. Industrial developers currently seek large sites for several reasons. First, most firms anticipate the possibility of expansion and prefer to acquire a site large enough to accommodate any foreseeable growth. There are both cost and control advantages in acquiring all of the land at one time. Second, the trend towards automation and more highly systematic manufacturing operations generally dictates

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[4] Characteristics of 63 Modern Industrial Plants, Economic Development Administration, United States Department of Commerce, Washington, 1966

Table X. Estimated Employment Densities
Birmingham Urban Area, 1965[a]

	Average number of workers per acre	
	Manufacturing	Trade and services
Inner areas		
Sectors		
0	516[b]	96[b]
1	8	8
2	17	6
3	22	10
4	95[c]	22[c]
5	2	3
6	10	10
7	11	12
8	8[c]	4[c]
Overall average	12[c]	12[c]
Outer areas		
Sectors		
1	2	2
2	6	1
3	4	5
4	-	4
5	3	2
6	1	4
7	4	2
8	-	2
Overall average	3	2

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[a] Source: Records of the Birmingham-Jefferson County Regional Planning Commission.

[b] Birmingham Central Business District.

[c] Southside and University of Alabama Campus and Medical Center.

[d] Overall densities, excluding the Southside and the Birmingham Central Business District (Sectors 0 and 4), were 10 workers per acre for manufacturing and 8 for trade and services.

Table XI. Employment Densities of Recent Industrial Plants, United States[a]

Category	Number of firms	Employees per acre
Food	5	7
Textiles	1	11
Apparel	2	233
Paper	5	14
Chemicals	6	7
Petroleum	none	-
Primary metals	none	-
All other manufacturing	38[b]	9.8
	41[c]	12.4

[a] Source: Characteristics of 63 Modern Industrial Plants, Economic Development Administration, United States Department of Commerce, Washington, 1966.

[b] Excludes 3 firms with over 30 employees per acre.

[c] Includes 3 firms with over 30 employees per acre.

single-story plants and frequently requires a considerable amount of extensive floor space. Third, recently constructed plants generally draw upon widely dispersed labor markets and considerable employee parking space therefore has to be provided. Last, even the intangible attributes of good neighborliness and prestige dictate that some space be devoted to nonproductive uses, such as landscaping.

A review of the densities from these various sources indicated that most densities are based on existing development which had taken place over varying periods of time and which are not entirely indicative of the most recent trends in industrial development. The most recent trends would probably reveal somewhat lower densities. In considering a 50- or 60-year projection period, it was felt that fairly low, conservative figures should be used, not merely as a reflection of the trend toward declining density, but also to provide a safety factor since the densities were to be used in evaluating the sufficiency of the land supply. In this context it was thought to be better to overestimate rather than underestimate the need. In addition, the use of low densities pays some recognition to the flexibility that is necessary in providing a choice of sites for industrial prospects. This latter point is a minor one, but it adds weight to the argument in favor of a conservative density coefficient.

In the light of these considerations, it was decided to use a density coefficient of 10 workers per net acre for general manufacturing employment, which is in the low range of available data on average densities. Because water-oriented uses tend to be more extensive than general-manufacturing uses, and because water sites are a critical factor in the study, a slightly lower density coefficient of 7 workers per net acre was adopted for water-oriented industry.

2. Nonmanufacturing density

The second density coefficient that was developed was for all other employment categories that require a significant amount of land. These included retail and wholesale trade, services, and government. Density data for these categories are scarce and the only available

source was the records on land use of the Birmingham-Jefferson County Regional Planning Commission referred to in Table X.

For trade and service categories, these records show average densities of two employees per acre in the outer portions of the urban area and 12 employees per acre in the inner portions. The inner portions contain the downtown area of Birmingham and the extensive south-side and medical-center complex. These areas serve a broad single- or multi-state region and would not normally be typical of the kind of development that would be experienced in the growth of the 12-county impact area. Excluding these two Birmingham areas, the average density in the inner part of the urban area was found to be about 8 workers per acre.

In considering the growth likely to occur within the 12-county impact area, it was felt that the inner areas of Birmingham, even without the two unusual sectors, would not be representative because of their heavy proportion of relatively old or long-established commercial centers, which demonstrate intensive land-use practices. On the other hand, the outer areas contain a number of major regional shopping centers, which tend to reduce the density and which would not be typical of requirements in many parts of the impact area. It was felt that some number between these extremes would be more realistic and an average density of 5 persons per net acre was selected.

3. Gross population density

The third density coefficient that was developed pertains to all other remaining uses of land (in urban areas) and is generally related to general population requirements. The most important of these other uses are for dwellings, local streets and roads, other public and semi-public functions that are strongly related to population, and transportation, communications, and utilities, which cannot be related directly to population, but which require a fairly small proportion of land in a typical urban area.

Here again, sources of data are limited and reliance was placed on the data on land use and population of the Birmingham-Jefferson County Regional Planning Commission. This source was considered appropriate because its data are relatively current (1965) and relate to an area which, although different in character and considerably larger, is adjacent to the impact area. The data, moreover, are available for subdivisions of the Birmingham planning area (see Figures 4 and 5). The characteristics of these subdivisions vary considerably and can be related to potential growth sections of the impact area. The applicable data are tabulated in Table XII.

This tabulation shows that the gross densities for land other than manufacturing, trade, and service varied from 1.4 to 3.6 persons per acre in the outer parts of the Birmingham urban area. Data for the inner portions of the urban area were not included because it was felt that these would not be typical of the growth that will be experienced in the impact area.

Review of the data on an area basis revealed that the outer part of Sector 2 experienced growth around a small community of about 2500 people during the last five to ten years. This area is primarily residential, but experienced growth in distribution and light industry in more recent years. This is probably typical of large sections of the impact area where growth will probably occur by accretion around existing communities. Sector 7 experienced a similar pattern in which growth occurred around two slightly larger communities. Sector 8 also shows a similar pattern and, in addition, includes a large area which developed adjacent to an old portion of the City of Birmingham. Sector 3 experienced more recent growth of upper-middle and higher-income subdivisions.

All of these areas range between 1.2 and 3.4 persons per acre for total developed land. A gross density standard of 2.5 persons per acre was therefore considered reasonable in that it would allow for a variety of development patterns, such as normal additions to smaller communities and additions around larger communities that encompass wide variations in income levels. This pattern was also considered appropriate for corridor-type development. It was felt, too, that

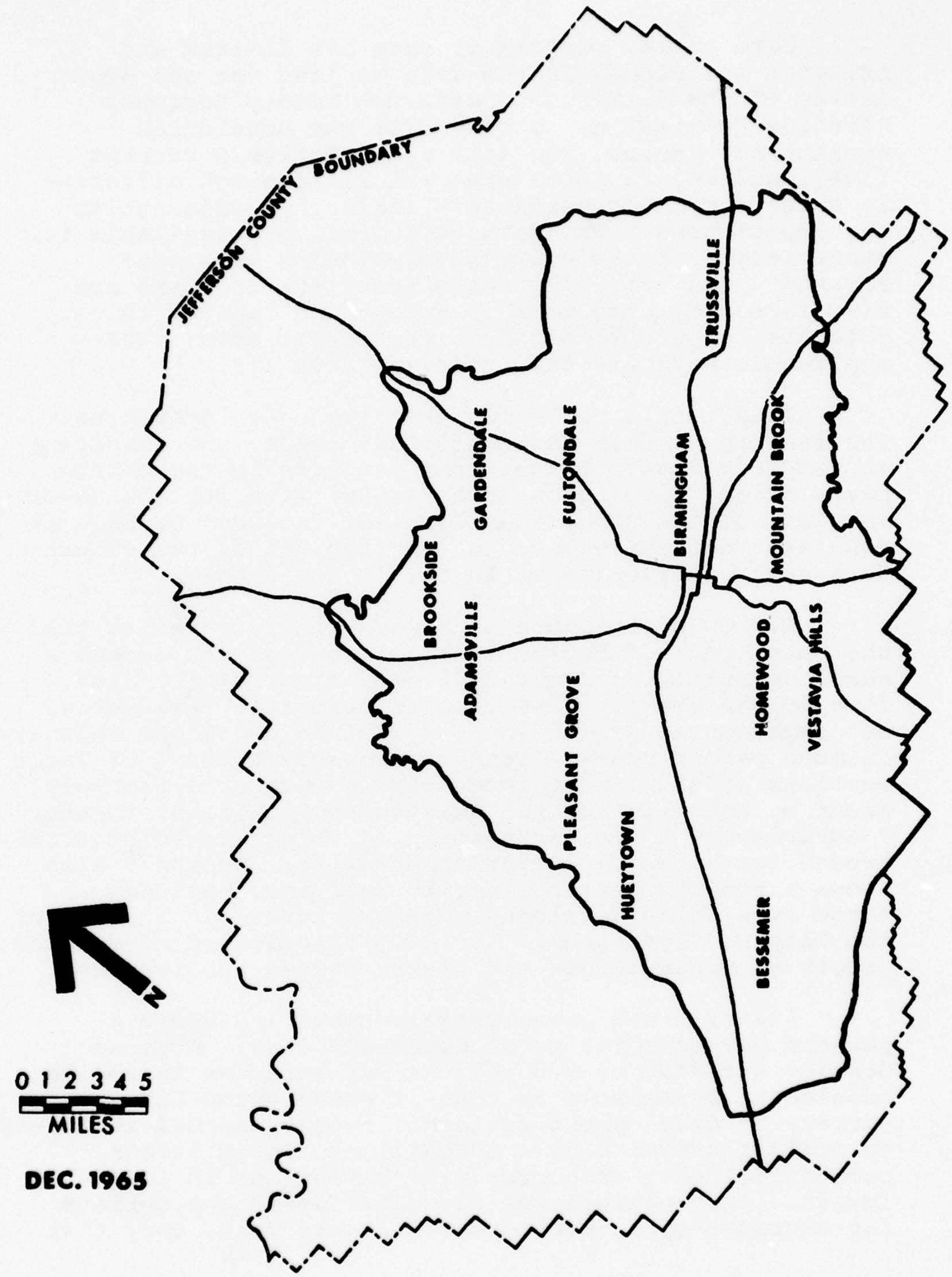

Figure 4. Jefferson County and the Birmingham Urban Area

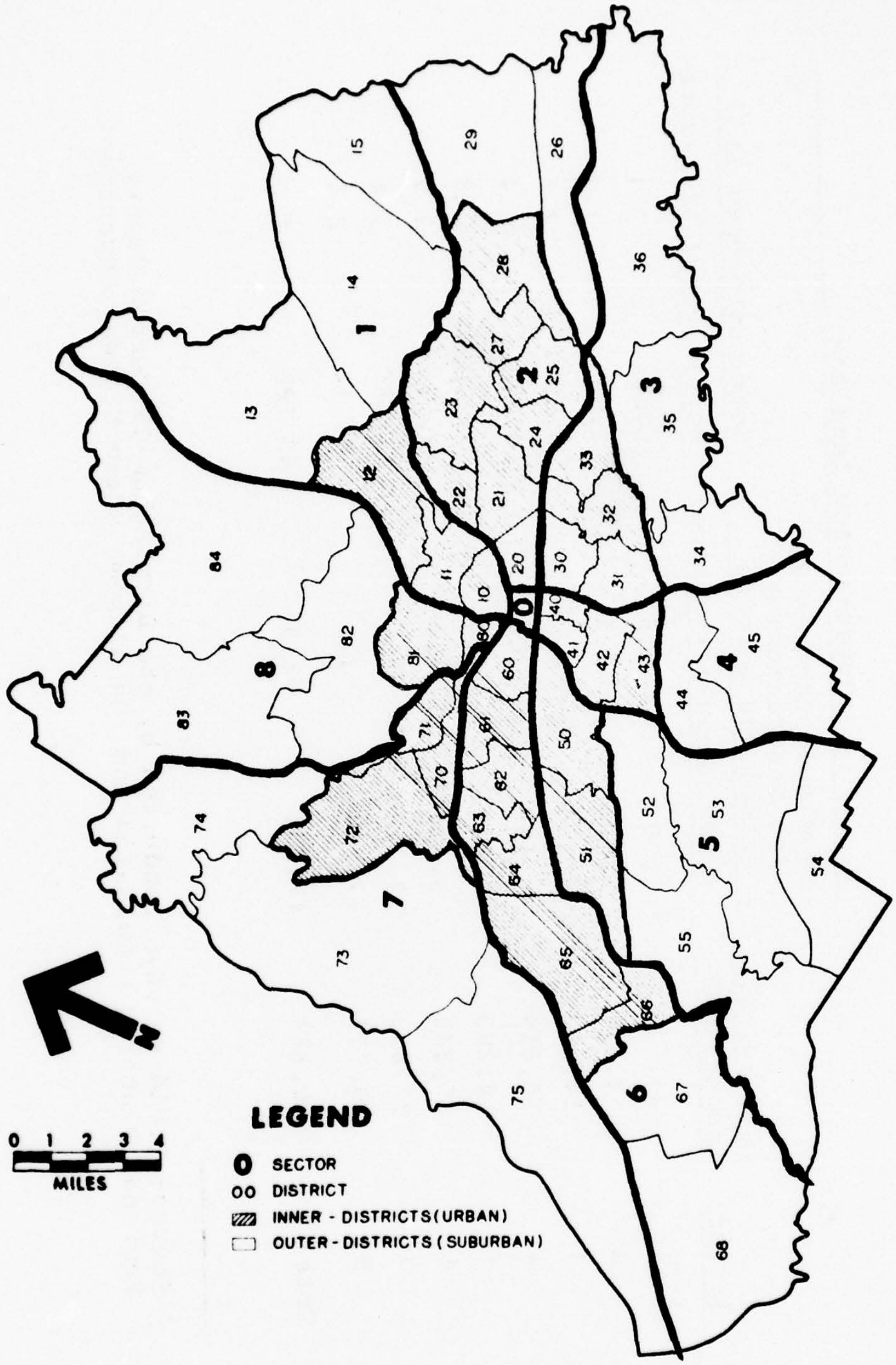

Figure 5. Inner and Outer Districts of the Birmingham Urban Area

Table XII. Gross Densities of Outer Sectors, Birmingham Urban Area, 1965[a]

		Outer-sector land use			
		Developed land except for manufacturing, trade, and service		Total developed land	
Sector	Outer-sector population	Acres	Population/acre	Acres	Population/acre
1	25,733	7,394	3.5	8,416	3.1
2	4,071	2,908	1.4	3,239	1.2
3	14,264	5,318	2.7	5,527	2.6
4	15,019	4,158	3.6	4,370	3.4
5	16,283	5,428	3.0	5,766	2.8
6	16,342	5,100	3.2	5,576	2.9
7	27,833	9,018	3.1	11,680	2.4
8	20,777	7,858	3.2	8.614	2.4
Total	140,322	47,182	3.3	53,188	2.6

a Source: Field surveys conducted by the Birmingham-Jefferson County Regional Planning Commission and the Alabama State Highway Department.

the density of 2.5 would, if anything, be conservative and would therefore tend to overestimate the amount of land required. As indicated earlier, this was considered an advantage because if the land were found to be sufficient under these conditions it could probably support all of the growth anticipated in the impact area without any undue problems.

D. Use of the Density Coefficients

The density coefficients were first applied to the estimated increases in both water-oriented and non-water-oriented manufacturing employment and to the increase in trade, service, and government employment within each county in the Coosa River impact area.

The estimated increase in population in each county was then reviewed to determine the proportion that might be urban in character. Most estimates of future growth anticipate that the national trend toward urban growth will continue and will in fact accelerate. It was therefore assumed for all counties in the impact area that the largest proportion of the increase in population would be urban in character. The proportion actually assigned as urban was based on a review of the current urban and rural breakdown within each county.

Two counties, Cherokee and Coosa, had no urban population in 1960 and each had only one community that approached 2,500. While it was assumed that the largest part of the increase would be added to the main community in each and could be classified as urban, the proportion for urban was set at 70%, somewhat less than that for the remaining counties. Population in St. Clair County was about 18% urban in 1960, but St. Clair has only one major community and only a modest amount of population growth was anticipated; the incremental population was assumed to be 80% urban. For most of the remaining counties the urban population was assumed to be 90% because these had a variety of urban communities and were expected to experience appreciable growth during the projection period. Etowah and Montgomery Counties both contain a major population center and their increases were estimated at 95 and 98% urban, respectively. The difference in percentages reflects their difference in size.

Based on these percentages, the increase in urban population was estimated for each county and the gross density coefficient was applied to the increase to derive an estimate of the amount of land that might be needed for all purposes other than major employment-generating activities.

It should be noted that no estimates were made for land for rural population. It was assumed that this population would be widely scattered and would have no problem finding suitable space; rural land, therefore, was not considered to be a constraint on economic growth.

E. Estimated Land Requirements

The estimates of the increases in land required for employment and for all other purposes were then combined for each county to provide an estimate of the total amount of additional land that would be required to accommodate the growth that is forecasted for the projection period (see Table XIII). Estimates of additional urban land requirements are presented in Figure 2, which was introduced earlier.

To provide a rough check on the reasonableness of these forecast estimates, an overall density of persons per acre of total land was calculated. These ranged from 1.9 in Shelby County to 2.4 in Talladega County; the average appeared to be about 2.2 persons per gross acre. These were then compared with the comparable data for the outer parts of the Birmingham urban area, as shown in Table XII, above, which ranged from 1.2 to 3.4, and averaged 2.6. On the basis of this comparison it was felt that the estimating procedures described above provided a reasonable relationship between total land required and population. Although the figures were slightly lower than those for the Birmingahm area, the latter reflect current and recent historical trends; and it was assumed that densities would generally decrease in the future.

The resulting estimates were therefore accepted as a basis for evaluating sufficiency of land within each county.

Table XIII. Urban Land in 1960 and Anticipated Increases in Population and Employment and in Land Requirements, Coosa River Impact Area, 1960 to 2030

	Autauga, Alabama		Calhoun, Alabama		Cherokee, Alabama		Chilton, Alabama		Coosa, Alabama		Elmore, Alabama	
	Increase in population or employment	Land, in acres	Increase in population or employment	Land, in acres	Increase in population or employment	Land, in acres	Increase in population or employment	Land, in acres	Increase in population or employment	Land, in acres	Increase in population or employment	Land, in acres
Population												
Urban	37,766	15,110	179,540	71,820	22,731	9,100	48,424	19,370	9,200	3,680	45,239	18,100
Rural	4,196	-	19,949	-	9,740	-	5,380	-	3,910	-	5,027	-
Total	41,962	15,110	199,489	71,820	32,471	9,100	53,804	19,370	13,110	3,680	50,266	18,100
Employment												
Water-oriented manufacturing	729	104	(420)	-	649	90	181	30	975	140	1,667	240
Non-water oriented manufacturing	1,055	106	15,742	1,570	2,344	230	3,701	370	1,204	120	2,798	280
Total employment	1,784	210	15,322	1,570	2,993	320	3,882	400	2,179	260	4,465	520
Trade and service[a]	12,093	2,420	61,323	12,260	5,361	1,070	9,795	1,960	3,118	620	15,064	3,010
All other[b]	146	-	8,876	-	3,397	-	-	-	(115)	-	37	-
Total	14,023	2,630	85,521	13,830	11,751	1,390	13,657	2,360	5,182	880	19,566	3,530
Grand total (square miles)		17,740 (28)		85,650 (134)		10,490 (16)		21,730 (34)		4,560 (7)		21,630 (34)
River-frontage sites		-		803		5,729		-		-		10,383
***Urban land, 1960*[c]**		*4,500*		*15,000*		*2,000*		*8,200*		7,400		11,200

	Etowah, Alabama		Montgomery, Alabama		Shelby, Alabama		St. Clair, Alabama		Talladega, Alabama		Floyd, Georgia	
Population												
Urban	195,650	78,260	227,808	91,120	61,582	24,630	82,000	32,800	137,117	54,850	121,019	48,410
Rural	10,302	-	4,648	-	6,843	-	26,182	-	1,385	-	13,447	-
Total	205,952	78,260	232,456	91,120	68,425	24,630	108,182	32,800	138,502	54,850	134,466	48,410
Employment												
Water-oriented manufacturing	(1,173)	-	504	70	1,751	250	638	90	4,480	640	4,433	630
Non-water oriented manufacturing	16,709	1,670	11,441	1,150	4,104	410	4,541	450	9,077	910	17,079	1,710
Total employment	15,536	1,670	11,945	1,220	5,855	660	5,179	540	13,557	1,550	21,512	2,340
Trade and service[a]	48,864	9,770	82,121	16,420	13,455	6,690	12,307	2,460	31,489	6,300	27,146	5,430
All other[b]	9,072	-	(3,171)	-	4,610	-	4,238	-	7,335	-	6,173	-
Total	73,472	11,440	90,895	17,640	23,920	7,350	21,724	3,000	52,381	7,850	54,831	7,770
Grand total (square miles)		89,700 (140)		108,760 (170)		31,980 (50)		35,800 (56)		62,700 (98)		56,180 (88)
River-frontage sites		11,417		1,040		11,614		1,206		5,416		24,858
Urban land, 1960[c]		18,000		22,000		9,000		2,200		16,000		16,000

[a] Trade, finance, service, and public administration.

[b] Agriculture, mining, and construction, transportation, communications, utilities, and armed forces

[c] Based on data published by the Alabama Conservation Needs Committee, 1958.

F. Land Sufficiency

The next step was to review the available maps of each county and determine where growth would most likely occur. In several cases there was only one sizable community in a county and it was assumed that the growth would occur around this community. This is true even in cases in which urban centers are somewhat removed from the river bank where significant industrial development is expected to take place. In no instance is a riverside site more than 30 minutes of driving time from a population center in which it was assumed growth would occur.

Where there were two or more urban centers, the anticipated growth was allocated among them on the basis of their relative size in 1960 and on the crude assumption that their drawing power for additional growth would be roughly in proportion to their size. This procedure was varied somewhat in those parts of the impact area where it appeared that growth corridors were likely to develop. This was the case either (1) between two major communities as a result of the trends that have already appeared and the added impetus of improved highway connections within the corridors or (2) within corridors between areas where major development may occur along the river and in adjoining urban centers.

In all cases, the amount of land available in the areas of growth was measured approximately to insure that there was sufficient land available to match the estimate of land required. In most instances, the amount of land was in fact more than sufficient and it appeared that land availability would not present any problems in supporting the expected development. In a few instances it was found that constraints of topography, the existence of military reservations, or major holdings, such as national forests or major recreational areas, would not allow expansion in all directions from the existing urban center or corridor. Despite the fact that growth would have to be channeled into specific directions and areas in these cases, there still was no problem of land sufficiency.

G. Evaluations by County

A brief review of land development in each individual county is presented below.

1. Autauga County, Alabama

In Autauga County, growth is expected to require about 28 square miles of additional land. Prattville is the only major community and growth was assumed to occur around this community, particularly south to Montgomery in the I-65 and U.S. 31 corridor.

2. Calhoun County, Alabama

Calhoun County is expected to require 134 square miles of land for growth during the projection period. It is expected that 85 to 90% of this growth will occur in the Oxford-Anniston-Jacksonsville-Gadsden corridor, which links I-20 on the south to I-59 on the north via U.S. 431. This corridor will be restricted to somewhat narrow development because of the Fort McClellan military reservation north of Anniston, the Talladega National Forest east of Anniston, and the Anniston Ordnance Depot on the west. There is still, however, a substantial amount of land available north to the county line. The remaining portion of the urban growth is expected to center around Piedmont, which is a smaller community on U.S. 278 and which has shown some recent growth activity.

3. Cherokee County, Alabama

The modest increase anticipated for Cherokee County will require about 15 square miles of land for urban development. Centre is the only sizable town in this county. It is adjacent to a newly created lake, has potentials for recreation development, and is located on U.S. 411. It was assumed that Centre will absorb virtually all of the urban development of the county and most of this is expected to occur in the south away from the lake.

4. Chilton County, Alabama

It was concluded that 34 additional square miles of land are needed for growth in Chilton County and that this land will be somewhat dispersed. Clanton is the only sizable town and is adjacent to the interstate highway I-65 and to recreation areas on the Coosa River. It was assumed that about 75% of the anticipated growth will occur in the vicinity of Clanton, mainly between the community and I-65. The balance of growth is expected to go to two or three smaller communities located in the I-65 corridor, such as Grove Hill, Jemison, and Thorsby. Although the eastern and western extremities of this county contain rough topography, the central area, through which I-65 runs, has a more gentle configuration and is more amenable to development.

5. Coosa County, Alabama

Coosa County is expected to experience the smallest amount of growth in the impact area and to require only seven square miles of additional land during the projection period. There is no urban development as such within the county and Goodwater is the only sizable town. It lies on U.S. 280 between Sylacauga and Alexander City and is expected to absorb all of the urban growth in the county. Goodwater is located more than a half-hour drive from the Coosa River, and is within easy reach of both larger towns. There is sufficient land in the vicinity of Goodwater to accomodate expected growth.

6. Elmore County, Alabama

Future growth in Elmore County is expected to require about 34 square miles of additional land. It is anticipated that Wetumpka will account for most of the growth, possibly as much as 80%. Wetumpka is on the Coosa River, is close to Montgomery, and has considerable available flat land around it. The balance of growth in the county is expected to occur in the vicinity of Tallassee at the eastern edge of Elmore. This is a somewhat isolated community and is surrounded by rough topography, but there is still sufficient land to accommodate 20% of the anticipated urban growth in this county.

7. Etowah County, Alabama

The growth in Etowah County is expected to require about 92 square miles of additional land for urban development. This small county is dominated by the Gadsden area and it is anticipated that all of this urban growth in the county will occur in the immediate vicinity of this urban complex. Topographical conditions will limit this growth primarily to areas south of Gadsden, which will form the upper end of the Gadsden-Anniston growth corridor.

8. Montgomery County, Alabama

Anticipated growth in Montgomery County was estimated to require between 150 and 170 square miles. It is anticipated that land development will follow a concentric pattern around the City of Montgomery, which is the only major community in the county. This pattern is expected to be followed in all directions, except north where the Alabama River is located. There are no serious problems of topography or land availability; major highways form a belt entirely around the urban area.

9. Shelby County, Alabama

Shelby County is characterized by a large number of small, scattered communities throughout its southern portion, and a broad belt of urban development along its northern boundary adjacent to Jefferson County. Projected growth in Shelby County will require about 50 square miles of additional land. It is anticipated that most of this growth will occur in the north as a result of the expansion of the Birmingham urban area and will extend southward as far as Pelham and Alabaster along the I-65 corridor. A moderate amount of growth is expected around Calera, which is adjacent to I-65, and around Columbiana, which is the county seat. A limited amount of growth is anticipated for Montevallo. A fairly substantial amount of growth is anticipated in the vicinity of Harpersville, which is near a group of prime river sites, and in the U.S. 280 corridor which extends southeastward to Childersburg and Sylacauga. The northern and western parts of Shelby County contain rough topography and there is a large state park in the

north. The south and east contain more gentle topography, overall, and there is no problem in finding the amount of land required in this county.

10. St. Clair County, Alabama

About 55 square miles will be needed to accommodate future growth in St. Clair County. Pell City is the largest town in this county and is located near I-20 and the Coosa River. There is also a growing amount of recreation facilities and activity on the river in the vicinity of Pell City and because of proximity of the town to the Atlanta-Birmingham interstate route, the town is expected to account for 60% of the future growth of the county. Ragland, which is now a very small community, is near river-front sites and has railroad connections. It is expected that Ragland will accommodate about 20% of future growth in the county. Springville, which is located in the I-59 corridor between Birmingham and Gadsen, also has growth potentials and is expected to account for 10% of the increase in the county. The remaining 10% is expected to be divided among small scattered communities in the interstate corridors. To a large extent, it was felt that this county will accommodate bedroom communities related to the three surrounding communities of Anniston, Gadsden, and Birmingham.

11. Talladega County, Alabama

Growth is expected to require about 98 square miles of additional land in Talladega County, which presently has three urban areas, Childersburg, Talladega, and Sylacauga. Childersburg is located close to the Coosa River and Sylacauga is about 10 miles southeast of it; both are connected by U.S. 280. At the present time this corridor accounts for about 50% of the urban population of the county and Talladega for the remaining 50%. However, the existence of this transportation corridor directly related to the river and the absence of any major topographical limitations led to the conclusion that about 70% of the urban growth in this county will occur in the Childersburg-Sylacauga corridor. The remaining 30% is expected to occur in and around Talladega and will evolve in all directions, except southeast where the Talladega National Forest adjoins the urban area.

12. Floyd County, Georgia

Anticipated growth is expected to create a demand for 88 square miles of additional urban land in Floyd County. Rome and its suburbs constitute the dominant urban center of this county and all of the growth in the county is expected to occur in urban areas. This growth is expected to occur mainly to the north and west because of topographic limitations; there will be some limited expansion to the southeast. Rome is expected to capitalize both on industrial sites and the recreation potential of the Coosa River.

13. Conclusion

In no case did any of the growth areas or corridors examined in the impact area present any problem in terms of sufficiency of land for the expected volume of future development. In most cases it was found that there is ample land available in the actual corridors or in land adjacent to the corridors in each county. Furthermore, a review of each county indicated that even if these location assumptions were not correct and growth occurred in other areas, there would still be relatively few limitations due to a lack of suitable land.

This conclusion is based on a cause-and-effect consideration. The counties for which relatively limited growth has been projected are those which have the most serious topographic conditions and the most isolated communities. The counties for which substantial growth is projected are those in which major communities are already developed and in which topography and access favor further development.

With the one exception of Goodwater in Coosa County, all of the corridors and growth areas delineated and measured in the impact area are within a half-hour driving time of the Coosa River and its potential industrial sites, and in many cases the corridors and growth areas are considerably closer. All are on major highways and a number are fairly close to interstate highways. Most also have major railroad connections.

On the basis of the review of the anticipated demand for and supply of land for urban development in the impact area, it was concluded that availability of land will not serve to restrict economic growth.

VI. ESTIMATES OF THE IMPACT OF WATER-ORIENTED INDUSTRY IN THE 12-COUNTY IMPACT AREA, 1980-2030

The purpose of this part is to provide estimates of the impact of water-oriented industries on employment, wages, and capital expenditures in the 12-county area for the period 1980-2030, by decade. These estimates were requested for the benefit of the Corps of Engineers to provide a basis for calculating a part of the expansion benefits attributable to the navigation project.

The estimation of direct employment and wage effects required a determination of the skill composition of employment and average annual wages for the water-oriented industries in the 12-county area by decade for the projection period. Indirect or induced employment and wages were determined by use of the "Nathan employment multipliers" for each of the counties. An attempt was made to estimate the portion of water-oriented employment and wages, both direct and indirect, that was attributable to barge navigation. This step involved the use of tonnage and employment data taken from individual company questionnaires obtained during the barge-traffic survey carried out for the Mobile District, Corps of Engineers.

The estimation of capital effects required a determination of 1) private capital expenditures for plant and equipment in barge-oriented plants and in commercial and residential construction, and 2) public capital outlays at the federal and nonfederal levels. The plant and equipment expenditures were related to employment in barge-oriented plants, while private construction and public capital outlays were related to the portion of the population attributable to employment in barge-oriented plants.

The final step in this section represented an attempt to separate the employment, wage, and capital impacts into the portions attributable to the lower (Montgomery to Gadsden, Alabama) and upper (Gadsden, Alabama to Rome, Georgia) sections of the Coosa River. This delineation was requested by the Corps of Engineers during the course of the study.

A. Employment Effects

1. Composition of employment

This section presents the results of an analysis of skill requirements by industry and county within the 12-county impact area. The major water-oriented industries considered were the following six 2-digit manufacturing industries: food, textiles, paper, chemicals, petroleum, and primary metals. Also considered were two additional types of manufacturing, namely, rubber tires and tubes and electrical equipment manufacturing, which were located in two counties in the impact area and which were expected to make use of barge navigation on the river.

The percentage composition of employment in the water-oriented industries was derived from data in the 1960 census of population for Alabama and Georgia.[5,6] A skill breakdown was calculated for each water-oriented industry by state using census data, as follows:

Skill classification	Census classification
Management	Management
Management support	Professional, technical, and kindred workers Clerical and kindred workers Sales
Skilled production workers	Craftsmen, foremen, and kindred workers

(continued)

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[5] United States Census of Population, 1960, Alabama, Detailed Characteristics, U. S. Department of Commerce, Bureau of the Census, Washington, 1962, pp 2-400 to 2-402.

[6] United States Census of Population, 1960, Georgia, Detailed Characteristics, U. S. Department of Commerce, Bureau of the Census, Washington, 1962, pp 12-542 to 12-544.

Skill classification	Census classification
Semi-skilled production workers	Operatives and kindred workers
Unskilled, including service, workers	Laborers and service workers

The appropriate percentage skill breakdown for each industry was then applied to the normal-growth employment projections by decade 1980 to 2030 for each water-oriented industry in each of the 12 impact counties. The percentage distribution of skills was held constant through the entire projection period. The data were then aggregated by skill for the 12-county area as a whole by decade 1980 to 2030 and are shown in Table XIV. It should be noted that, despite the use of a constant percentage distribution of skills for each industry, the composition of skills of projected employment in the area actually changes as a result of a shift toward greater employment in those industries which make relatively greater use of management and management-support personnel.

2. Average annual wages

This section presents the results of an analysis of wages arising from water-oriented industry in the 12-county impact area. Average annual (direct) wages per employee in each of the water-oriented industries in the 12-county impact area were derived from data in the Census of Manufactures for 1958 and 1963. For each water-oriented industry in Alabama and Georgia, respectively, total wages were divided by total employees in both 1958 and 1963 to obtain average annual wages per employee. Data for 1960 were obtained by interpolation. Wages were then assumed to increase 2.41 percent annually, which has been the average rate of increase in productivity in the United States between 1909 and 1966, to provide a basis for projecting wages by decade, 1980 to 2030 (see Table XV). The resulting projected annual wages per employee were then multiplied by the appropriate employment projections for the 12-county impact area to obtain direct wages by county, industry, and decade. The results were then aggregated for the

Table XIV. Estimates of Direct Employment, by Occupational Skill, Water-Oriented Industries, 12-County Coosa River Impact Area, 1980-2030

		1980	1990	2000	2010	2020	2030
Management	employees	1,627	1,936	2,320	2,638	3,030	3,553
	percent of total	3.75	4.10	4.42	4.55	4.66	4.70
Management support	employees	5,965	7,047	8,422	9,762	11,430	13,562
	percent of total	13.73	14.94	16.03	16.84	17.56	17.96
Skilled workers	employees	7,585	7,995	8,671	9,426	10,454	12,046
	percent of total	17.47	16.95	16.51	16.26	16.06	15.95
Semi-skilled workers	employees	22,723	24,340	26,735	29,285	32,627	37,784
	percent of total	52.32	51.60	50.90	50.51	50.14	50.03
Unskilled workers	employees	4,883	5,152	5,594	6,000	6,562	7,448
	percent of total	11.24	10.92	10.65	10.35	10.08	9.86
Not classified	employees	646	703	785	867	973	1,132
	percent of total	1.49	1.49	1.49	1.49	1.50	1.50
Total	employees	43,427	47,173	52,527	57,978	65,076	75,524
	percent of total	100.00	100.00	100.00	100.00	100.00	100.00

Table XV. Estimates of Average Annual Wages per Employee (1966 dollars), Water-Process and Barge-Oriented Industries, Alabama and Georgia, 1980-2030

	1980	1990	2000	2010	2020	2030
Direct employment						
Alabama						
Food	6,545	8,306	10,541	13,377	16,976	21,578
Textiles	5,459	6,928	8,791	11,156	14,157	18,010
Paper	10,200	12,943	16,425	20,844	26,450	33,565
Chemicals	9,160	11,625	14,753	18,721	23,759	30,224
Primary metals	10,791	13,694	17,379	22,054	27,988	35,603
Rubber tires and tubes	10,951	13,897	17,636	22,381	28,403	36,130
Georgia						
Food	6,375	8,090	10,267	13,029	16,536	21,032
Textiles	5,503	6,984	8,863	11,247	14,273	18,157
Paper	9,177	11,646	14,779	18,755	23,802	30,383
Chemicals	8,412	10,674	13,547	17,191	21,816	27,752
Primary metals	8,144	10,335	13,115	16,644	21,123	26,868
Electrical equipment	9,287	11,786	14,957	18,980	24,087	30,641
Induced employment	6,425	8,289	10,625	13,676	17,560	22,526

water-oriented industries in the 12-county area as a whole by decade 1980 to 2030 and are shown in Table XVI.

3. Multiplier effects

The direct employment in the water-oriented industries may be expected to give rise to additional or induced employment as a result of the "multiplier effect." The induced employment was estimated by applying a multiplier for each county (see Table XVII) to water-oriented employment in that county. The results were aggregated for the 12-county area and are included in Table XVI.

A skill breakdown for induced employment was prepared as requested and was based on 1960 Alabama census data for employment in industries other than manufacturing and agriculture. The results for the 12-county area by decade 1980 to 2030 are presented in Table XVIII. Because the skill breakdown was applied to total induced employment, rather than to totals for individual industries which are expected to grow at divergent rates, the percentages credited to each skill category remains the same throughout the projection period.

The wages arising from induced employment were determined by accepting the assumption in the Spindletop report[7] that service wages are 80% of production wages (see Table XVI). Data from the Census of Manufactures and other sources suggest that this figure was probably high in 1960 and appeared to be about 75%. However, recent and probable future increases in minimum wages and continued broadening of minimum-wage coverage may be expected to have a greater impact in the service sectors of the economy than in the production sector. Also, the increasing spread of unionism into the service sectors is likely to cause some closing of the pay gap between service and production workers. In the future, the 80% estimate may turn out to be the correct one as legislative changes in minimum wages and coverage, in addition to increased union activity, may reasonably be expected to raise the present percentage.

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[7] Expansion Benefits Analysis for the Salyersville-Royalton Area Pilot Project, Spindletop Research Center, Lexington, 1967, p 225.

Table XVI. Estimates of Direct and Induced Employment and Wages, Water-Oriented and Barge-Related Industries, 12-County Coosa River Impact Area, 1980-2030

	1980	1990	2000	2010	2020	2030
Water-Oriented						
Direct employment	43,427	47,173	52,527	57,978	65,046	75,524
Induced employment	47,455	52,487	58,649	64,832	72,838	84,581
Total employment	90,882	99,660	111,176	122,810	137,884	160,105
Direct wages (thousands of 1966 dollars)	351,275	488,777	697,011	989,013	1,425,909	2,123,251
Induced wages (thousands of 1966 dollars)	304,901	423,086	623,160	886,651	1,279,005	1,905,306
Total wages (thousands of 1966 dollars)	656,176	911,863	1,320,171	1,875,664	2,704,914	4,028,557
Barge-related: high estimate (39.59% of water-oriented)						
Direct employment	17,193	18,676	20,795	22,953	25,752	29,900
Induced employment	18,787	20,780	23,219	25,667	28,837	33,486
Total employment	35,980	39,456	44,014	48,620	54,589	63,386
Direct wages (thousands of 1966 dollars)	139,070	193,506	275,947	391,551	564,517	840,596
Induced wages (thousands of 1966 dollars)	120,710	172,250	246,709	350,629	506,358	754,311
Total wages (thousands of 1966 dollars)	259,780	365,756	522,656	742,180	1,070,875	1,594,907
Barge-related: low estimate (4.41% of high estimate)						
Direct employment	758	824	917	1,012	1,136	1,319
Induced employment	829	916	1,024	1,132	1,272	1,477
Total employment	1,587	1,740	1,941	2,144	2,408	2,796
Direct wages (thousands of 1966 dollars)	6,133	8,534	12,169	17,268	24,896	37,071
Induced wages (thousands of 1966 dollars)	5,323	7,596	10,879	15,463	22,330	33,265
Total wages (thousands of 1966 dollars)	11,456	16,130	23,048	32,731	47,226	70,336

Table XVII. Employment Multipliers for the 12 Counties in the Coosa River Impact Area

County	Multiplier
Autauga, Alabama	1.90
Calhoun, Alabama	2.03
Coosa, Alabama	1.88
Elmore, Alabama	1.91
Cherokee, Alabama	1.59
Chilton, Alabama	1.89
Etowah, Alabama	2.08
Montgomery, Alabama	2.21
Shelby, Alabama	2.03
St. Clair, Alabama	2.08
Talladega, Alabama	2.19
Floyd, Georgia	2.27

a. Source: Recreation as an Industry, Robert R. Nathan Associates, Inc., Washington, 1966, pp. 109 and 123-24.

Table XVIII. Estimates of Employment by Occupational Skills Induced by Water-Oriented Industries, 12-County Coosa River Impact Area, 1980-2030

	1980	1990	2000	2010	2020	2030
Management						
employees	4,940	5,464	6,105	6,749	7,582	8,805
percent of total	10.41	10.41	10.41	10.41	10.41	10.41
Management support						
employees	16,282	18,008	20,122	22,244	24,991	29,020
percent of total	34.31	34.31	34.31	34.31	34.31	34.31
Skilled workers						
employees	6,216	6,876	7,683	8,493	9,542	11,080
percent of total	13.10	13.10	13.10	13.10	13.10	13.10
Semi-skilled workers						
employees	5,600	6,193	6,921	7,650	8,595	9,981
percent of total	11.80	11.80	11.80	11.80	11.80	11.80
Unskilled workers						
employees	12,661	14,004	15,648	17,297	19,433	22,566
percent of total	26.68	26.68	26.68	26.68	26.68	26.68
Not classified						
employees	1,756	1,942	2,170	2,399	2,695	3,129
percent of total	3.70	3.70	3.70	3.70	3.70	3.70
Total						
employees	47,455	52,487	58,649	64,832	72,838	84,581
percent of total	100.00	100.00	100.00	100.00	100.00	100.00

4. Impact of the navigation project

It was recognized that only a portion of total employment and wages, both direct and induced, for the water-oriented industries in the 12-county impact area may properly be attributed to the effects of opening the Coosa River to barge navigation. Two approaches were followed to estimate that portion of water-oriented employment and wages which may be considered as barge-related.

The first approach, which yielded a high estimate, involved expressing employment in barge-related plants as a percentage of total water-oriented employment. Data on employment in barge-related plants are obtained primarily from individual questionnaires for those companies identified by the Mobile District, Corps of Engineers as either shipping or receiving potentially bargeable commodities. Data on total employment for all barge plants in the 12-county area was then calculated. This total represented 39.59% of the employment in water-oriented industries in the area. If it is assumed that access to barge transportation is a critical factor in the decision of barge-related plants to locate in the area, then it would be appropriate to give the navigation project credit for 39.59% of the employment and wages, both direct and induced, for the water-oriented industries in the area for each decade 1980 to 2030. Data based on this supposition is presented in Table XVI as the high estimate.

The fact that the barge-related plants are already located in the area despite the absence of barge transportation limits the acceptability of the high estimate above. A second, lower estimate, presented in Table XVI, was therefore calculated. Using individual company questionnaires for the barge-related plants, an analysis was made of the potential barge tonnages credited to these plants. These tonnages were expressed as a percentage of the total tonnage, both inbound and outbound, handled by these same plants. The resulting figure was 4.41%. If it were assumed that this percentage also represents the portion of a plant's employment that is directly attributable to barge shipments, it would then be appropriate to give the navigation project credit for only 4.41% of the high estimate of employment and wages attributed to the barge-related plants above.

In the early years of the projection period, the low estimate may be the more valid one. By the end of the projection period, however, there may be support for contending that access to barge transportation could be the critical factor in the retention and growth of existing industry in the area. Access to barge transportation may also be critical in attracting new industry to the area. If this should be the case, then by the year 2030 the high estimate may then be the more valid of the two.

B. Capital Effects

High and low estimates of public and private capital effects were prepared based on the two approaches to the portion of water-oriented employment and wages attributable to the navigation project.

1. Private

a. Investment in barge-related plants

Estimates of investment in barge-related plants were developed in a series of steps. Data were obtained on capital invested per production worker, 1949-1960, for the types of industries in the Coosa area that are expected to make use of barge transportation.[8] These industries encompass food, textiles, rubber, paper, chemicals, primary metals, and electrical machinery. The investment data were adjusted to a 1966 price level, were weighted using the projected employment for each of these industries in the year 2000, and were then projected linearly by decade to 2030 (see Table XIX). The year 2000 was selected because it is the approximate midpoint of the projection period. The result was a series describing the capital coefficients per production worker that is applicable to the industry mix projected for the 12-county impact area. Data from the Census of Manufactures and the projected employment mix in the area indicated that production workers represented 79% of the employment in the barge-oriented plants. Multiplying

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[8] The Economic Almanac 1964, National Industrial Conference Board, New York, 1964, p 273.

Table XIX. Investment Associated with Employment in Barge-Oriented Plants, 12-County Coosa River Impact Area, 1980-2030

	1980		1990		2000		2010		2020		2030	
	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low
Supporting data												
Employment attributable to barge-oriented plants	17,193	758	18,676	824	20,795	917	22,953	1,012	25,752	1,136	29,900	1,319
Induced employment	18,787	829	20,780	916	23,219	1,024	25,667	1,132	28,837	1,272	33,486	1,477
Total barge-related employment	35,980	1,587	39,456	1,740	44,014	1,941	48,620	2,144	54,589	2,407	63,386	2,795
Population/worker ratio	2.82	2.82	2.79	2.79	2.77	2.77	2.75	2.75	2.73	2.73	2.71	2.71
Population attributable to barge-oriented plant employment	101,464	4,475	110,082	4,855	121,919	5,377	133,705	5,896	149,028	6,571	171,776	7,574
Investment data												
Industrial investment in barge-oriented plants												
Production workers in barge-oriented plants	13,582	599	14,754	651	16,428	724	18,133	799	20,344	897	23,621	1,042
Capital per production worker (1966 dollars)	47,717	47,717	56,537	56,537	65,356	65,356	74,175	74,175	82,995	82,995	91,814	91,814
Total capital (thousands of 1966 dollars)	648,092	28,582	834,147	36,806	1,073,668	47,318	1,345,015	59,266	1,688,450	74,447	2,168,738	95,670
Commercial construction												
Per capita (1966 dollars)	41	41	52	52	66	66	83	83	105	105	132	132
Total (thousands of 1966 dollars)	4,160	183	5,724	252	8,047	355	11,098	489	15,648	690	22,674	1,000
Residential construction												
Per capita (1966 dollars)	200	200	252	252	318	318	401	401	505	505	636	636
Total (thousands of 1966 dollars)	20,293	895	27,741	1,223	38,770	1,710	53,616	2,364	75,259	3,318	109,250	4,817
Public capital outlays												
Federal per capita (1966 dollars)	148	148	187	187	236	236	297	297	374	374	471	471
Federal total (thousands of 1966 dollars)	15,017	662	20,585	908	28,773	1,269	39,710	1,751	55,736	2,458	80,906	3,567
State and local per capita (1966 dollars)	111	111	140	140	176	176	222	222	280	280	352	352
State and local total (thousands of 1966 dollars)	11,263	497	15,411	680	21,458	946	29,683	1,309	41,728	1,840	60,465	2,666

the number of production workers attributable to the barge-oriented plants for each decade by the capital per production worker for that decade gives the projected capital required by decade for the employment in the barge-oriented plants associated with river navigation.

b. Commercial construction

A series on private commercial construction per capita in 1966 dollars was calculated as requested. This series was projected to increase at a constant annual rate of 2.36% on the assumption that the share of real gross national product attributable to construction will remain relatively constant throughout the projection period to 2030. The 2.36% annual growth in real gross national product per capita was obtained by subtracting from the Water Resources Council projected growth rate of real gross national product (3.61%) the projected population growth rate (1.25%) from the same source. Applying the resulting values of commercial construction expenditures per capita by decade to the population attributable to the direct and induced employment in barge-oriented plants by decade gives the projected investment in private commercial construction associated with river navigation.

c. Residential construction

A series on private residential construction per capita in 1966 dollars was also calculated as requested. This series was projected to increase at a constant annual rate of 2.36% on the same assumption as was made above for commercial construction. Applying the resulting values of residential construction expenditures per capita by decade to the population attributable to the direct and indirect employment in barge-oriented plants by decade gives the projected investment in private residential construction associated with river navigation.

2. Public

a. Federal capital outlays

Expenditures per capita by the federal government on capital outlays were projected to rise at an annual rate of 2.36% which will result in this expenditure remaining a constant percentage share of real gross national product during the projection period. Applying the resulting values of federal capital outlays per capita by decade to the population attributable to the direct and induced employment in barge-oriented plants gives the projected federal-government investment associated with river navigation.

b. State and local capital outlays

State and local governments, as a whole, have been devoting about 23.5% of their total expenditures to capital outlays. This percentage was applied to the annual expenditure per capita on capital outlays by state and local governments in Alabama, giving a value for state and local government capital outlays per capita applicable to the area under study. These expenditures were projected to rise at an annual rate of 2.36% which will result in this classification of expenditures remaining a constant percentage share of real gross national product during the projection period. Applying the resulting values of state and local government capital outlays per capita by decade to the population attributable to the direct and indirect employment in barge-oriented plants gives the projected state and local-government investment associated with river navigation.

C. Division of Impact Between Upper and Lower Sections of the Coosa River

The prospective impact of the Coosa navigation program on the 12-county area was divided into the portion attributable to the lower section of the river between Montgomery and Gadsden, Alabama and the portion attributable to the upper section between Gadsden, Alabama and Rome, Georgia. This was accomplished by

analyzing the location of those companies identified during the barge-traffic survey as having potentially bargeable commodities. Proportions were calculated which attributed to the upper section all the tonnage expected to move on the Coosa River between Gadsden and Rome on the assumption that this tonnage would be completely lost to the river if only the lower section to Gadsden were made navigable. The proportions described below may be applied to either the high or low estimates of employment, wages, and capital effects:

	Lower section	Upper section
High estimate (39.59% of water-oriented employment and wages	82%	18%
Low estimate (4.41% of high estimate above)	71%	29%

The high estimate, as explained earlier, was derived from data on employment in barge-oriented plants relative to employment in water-oriented industries. The low estimate, on the other hand, was derived from potential barge tonnages relative to total tonnages handled by barge-oriented plants.

D. Unemployment and Underemployment

During the course of the survey, the Corps of Engineers requested data on the extent of unemployment and underemployment in the Coosa River impact area. This data is presented in Tables XX and XXI.

The unemployment figures are those presented in the reports on the 36 counties of the Coosa River tributary area. The underemployment data for 1960 are estimates based on the difference between national and county labor participation rates. The data for 1959 and 1966, respectively, are based on number of families or households receiving incomes of less than $3000 per year.

Table XX. Unemployment, 12-County Coosa River Impact Area, March, 1960 and 1966

County	1960 Number unemployed	1960 Unemployment rate (%)	1960 Unemployed in excess of 4%	1966 Number unemployed	1966 Unemployment rate (%)	1966 Unemployed in excess of 4%
Autauga, Alabama	191	4.1	5	202	3.6	-
Calhoun, Alabama	1,973	5.6	564	1,196	3.2	-
Cherokee, Alabama	381	9.4	219	208	5.5	47
Chilton, Alabama	668	11.7	440	400	6.7	161
Coosa, Alabama	190	7.5	89	120	4.6	16
Elmore, Alabama[a]						
Etowah, Alabama	4,969	14.7	3,617	1,703	5.3	418
Montgomery, Alabama[a]	3,606	4.9	662	2,218	2.8	-
Shelby, Alabama	641	11.6	420	458	8.9	252
St. Clair, Alabama	891	11.6	584	581	6.7	234
Talladega, Alabama	1,735	7.8	845	1,170	5.0	236
Total Alabama (11 counties)	15,245		7,445	8,256		1,364
Floyd, Georgia	1,498	5.4	388	1,003	3.4	-
Total, 12 counties	16,743		7,833	9,259		1,364

[a] Elmore County data are included in Montgomery County data.

Table XXI. Underemployment, 12-County Coosa River Impact Area, 1959, 1960, and 1966

County	1960[a] Under employment	1959[b] Number of families with $3000 per year (thousands)	1966[c] Number of households with cash income less than $3000 per year (thousands)
Autauga, Alabama	773	2.1	2.4
Calhoun, Alabama	844	7.1	7.7
Cherokee, Alabama	1,097	2.0	1.8
Chilton, Alabama	2,862	3.4	3.1
Coosa, Alabama	479	1.4	1.0
Elmore, Alabama	1,133	3.3	3.4
Etowah, Alabama	4,758	7.9	8.8
Montgomery, Alabama	-	12.4	14.7
Shelby, Alabama	2,241	3.2	3.4
St. Clair, Alabama	1,739	2.6	2.7
Talladega, Alabama	1,958	5.9	6.1
Total Alabama (11 counties)	17,884	51.3	55.1
Floyd, Georgia	-	5.0	4.7
Total, 12 counties	17,884	56.3	59.8

a. This measure of underemployment is based on the difference between national and county labor participation rates.

b. United States Census of Population, 1960, Alabama, General Social and Economic Characteristics, U. S. Department of Commerce, Bureau of the Census, 1962, pp 2-214 - 2-219. United States Census of Population, 1960, Georgia, General Social and Economic Characteristics, U. S. Department of Commerce, Bureau of the Census, 1962, p 12-324.

c. Sales Management, June 10, 1967, pp D-3 to D-6 and D-58 to D-67.

ACKNOWLEDGEMENTS

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Birmingham, Alabama
February 21, 1968
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REPORT FOR DEVELOPMENT

OF

WATER RESOURCES IN APPALACHIA

PART III - PROJECT ANALYSES

CHAPTER 10

STANNARD RESERVOIR PROJECT

GENESEE RIVER - NEW YORK AND PENNSYLVANIA

Office of Appalachian Studies

Corps of Engineers

September 1969

PART III

PROJECT ANALYSES

CHAPTER 10 - STANNARD RESERVOIR PROJECT

TABLE OF CONTENTS

TABLE OF CONTENTS (cont'd)

CHAPTER 10 - STANNARD RESERVOIR PROJECT

TABLE OF CONTENTS (cont'd)

CHAPTER 10 - STANNARD RESERVOIR PROJECT

TABLE OF CONTENTS (cont'd)

AD-A041 394 CORPS OF ENGINEERS CINCINNATI OHIO F/G 8/6

DEVELOPMENT OF WATER RESOURCES IN APPALACHIA. MAIN REPORT. PART--ETC(U)

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5 OF 6

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CHAPTER 10 - STANNARD RESERVOIR PROJECT

LIST OF TABLES

LIST OF TABLES (cont'd)

LIST OF TABLES (cont'd)

CHAPTER 10 - STANNARD RESERVOIR PROJECT

LIST OF EXHIBITS

PART III
PROJECT ANALYSES

CHAPTER 10 - STANNARD RESERVOIR PROJECT

SECTION I - SUMMARY

1. PHYSICAL DESCRIPTION

Stannard multiple-purpose reservoir site is located in Allegany County, New York and Potter County, Pennsylvania, in Sub-region F of the Appalachian Region. The damsite is located about four miles south of Wellsville, New York controlling 165 square miles of drainage area. The location, shown on exhibit 10-1, is approximately 142 miles above the mouth of the Genesee River.

Major physical features of the project would be the 2,300-foot long earth fill dam, a 190-foot wide gated spillway approximately 1,600 feet of levee on Marsh Creek, and recreation areas with appropriate public-use facilities surrounding a reservoir having a total storage capacity of 97,500 acre-feet.

2. PROJECT IMPACTS

The reservoir project has been planned to provide the services needed to satisfy the water related needs of the area, and thereby encourage development of the upper Genesee River Basin. The specific benefits realized from the project would be:

a. Flood damage reduction

b. Water supply for industrial use and irrigation

c. Water quality control

d. Fish and wildlife enhancement

e. Outdoor recreation opportunities

f. Economic development

The average annual damages to present and future developments between the reservoir site and Belmont, located approximately 15 miles downstream, would be reduced approximately 70 percent. Approximately one-third of the reservoir storage would be used to improve the quality of flows in the vicinity of Scio and outside of the Appalachian Region at Gates-Chili-Ogden, approximately 14 miles above the mouth of the Genesee River. Fish enhancement would be supplied for some 156,000 fishermen-days annually by the project through regulated releases for downstream trout fishery, through provision of a controlled, stocked reservoir with supporting facilities and access points around the reservoir. Limited hunting would be permitted wherever it would be consistent with safety of other recreationists and where adequate

game might be available. General outdoor recreation would be improved for about 233,000 users annually by provision of adequate recreation facilities. By maintaining minimum flows and providing three downstream access sites, white-water canoeing and small access site net benefits for canoers and spectators would accrue to about 105,000 users annually. The Stannard project would provide a water supply to meet daily flows of 95 cfs for a proposed pulp and paper mill, assuming the equivalent of good secondary treatment, and for supplemental irrigation of approximately 5,800 acres located in Allegany County, downstream of Wellsville. Economic development of the area of influence of the project would be supported through provision of additional job opportunities, both during and after project construction.

3. COSTS AND BENEFITS

Costs for constructing Stannard Reservoir and the recreational facilities are estimated at 37.5 million dollars; annual charges are estimated to be $1,490,000. Comparable values for induced investments are 20.2 million dollars with annual charges of $1,180,000. Annual benefits for the development are estimated as follows:

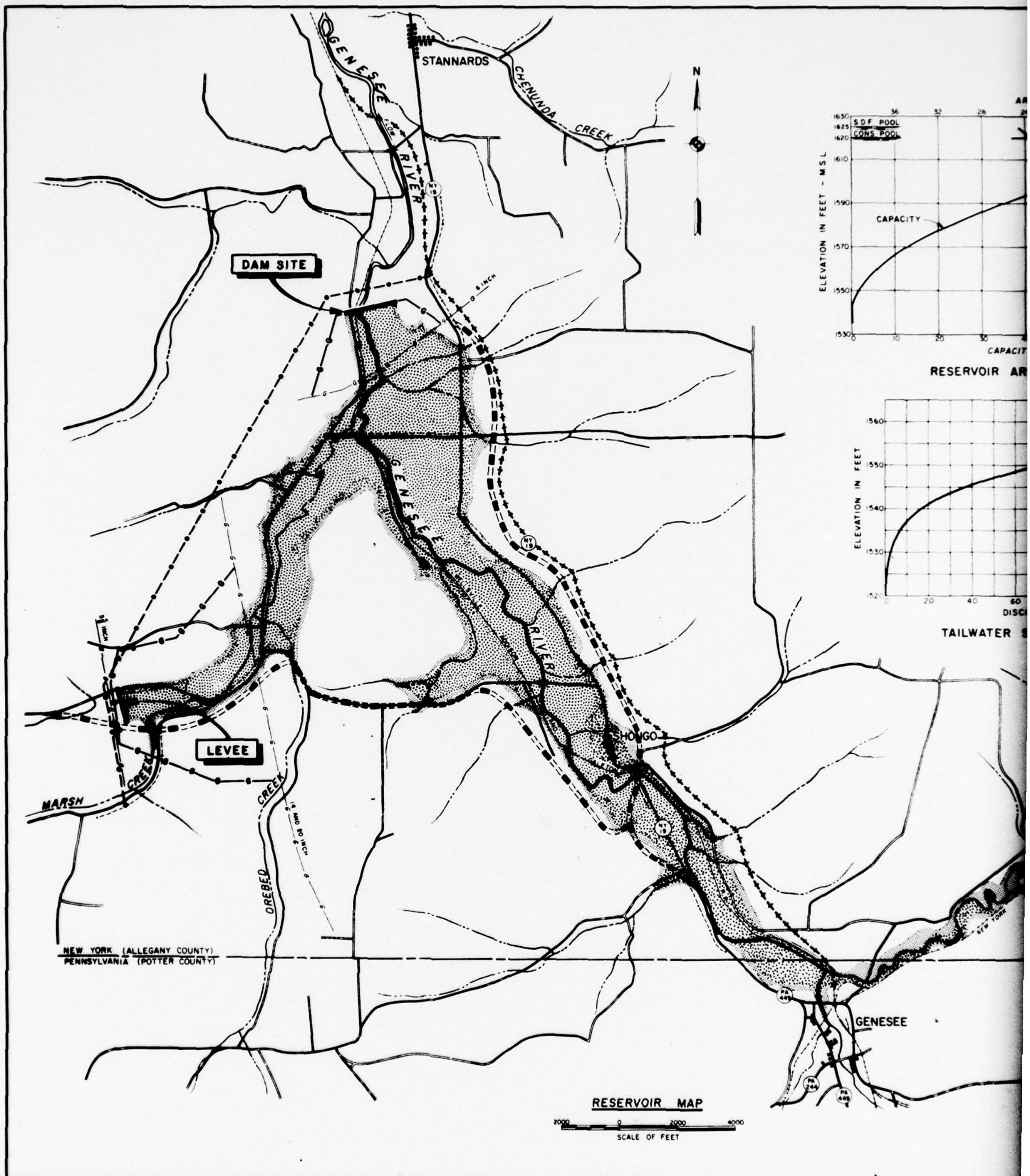
	INCOME	
	National	Regional
	$	$
Users	2,145,000	1,708,000
Expansion effects		
Redevelopment	56,400	349,000
Development	380,600	5,161,000
Loss of income from lands taken for project	-54,000	-460,000

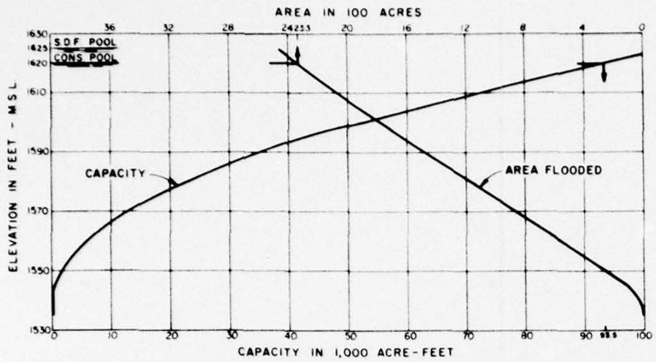
Using the preceding, the index of performance for the objective of increasing national income would be 1.4, and for increasing regional income, 1.9 (see Section VI).

4. COOPERATION REQUIRED FOR CONSTRUCTION

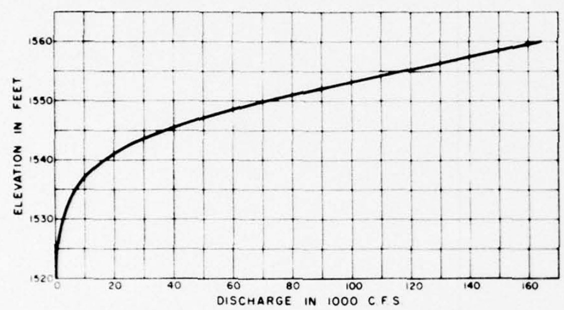
The Corps of Engineers would construct the dam, reservoir and initial recreation facilities, and operate the dam. The State of New York would construct future recreation facilities and share in the construction costs of all of the recreation facilities. The State of New York would also operate and maintain all of the recreation facilities.

The State of New York will be requested to provide assurances of local cooperation for cost sharing in the costs allocated to water supply and irrigation. Assurances for the irrigation costs would be furnished after local interests have formed the required "Irrigation Districts" with technical assistance supplied, if needed, by the United States Department of Agriculture.

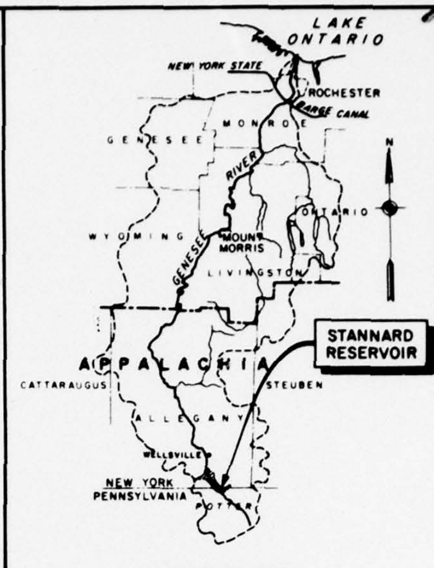

STANNARDS
GENESEE RIVER
CHENUNDA CREEK
N
DAM SITE
LEVEE
MARSH CREEK
OREBED CREEK
SHONGO
GENESEE
NEW YORK (ALLEGANY COUNTY)
PENNSYLVANIA (POTTER COUNTY)
S D F POOL
CONS POOL
ELEVATION IN FEET - MSL
CAPACITY
ELEVATION IN FEET
RESERVOIR MAP
2000 0 2000 4000
SCALE OF FEET



RESERVOIR AREA AND CAPACITY CURVES

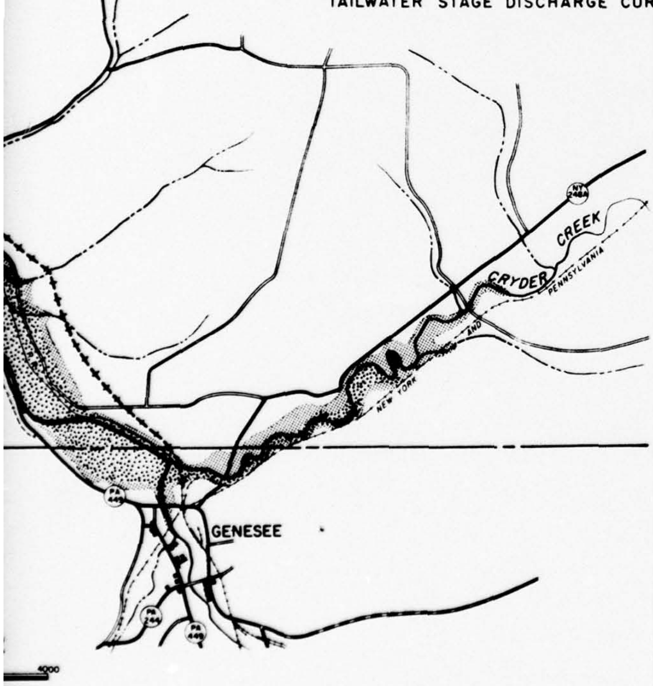


TAILWATER STAGE DISCHARGE CURVE



LOCATION MAP

SCALE IN MILES



LEGEND

- SPILLWAY DESIGN FLOOD POOL EL. 1625
- MAXIMUM CONSERVATION POOL EL. 1620
- HEAVY DUTY ROAD
- MEDIUM DUTY ROAD
- LIGHT DUTY ROAD
- UNIMPROVED DIRT ROAD
- RAILROAD
- RAILROAD, DISMANTLED
- POWER LINE – 4,800 VOLT
- NATURAL GAS PIPELINE
- PROPOSED RELOCATED HEAVY DUTY ROAD
- PROPOSED RELOCATED MEDIUM DUTY ROAD
- PROPOSED RELOCATED POWER LINE
- PROPOSED RELOCATED NATURAL GAS PIPELINE
- PROPOSED RELOCATED RAILROAD
- EXISTING STREAM

GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

STANNARD DAM AND RESERVOIR

CORPS OF ENGINEERS, BUFFALO DISTRICT

JUNE 1968

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Prior to construction, local interests should furnish assurances that they will: establish encroachment lines to permit efficient reservoir operation; contribute to pollution control by providing adequate treatment or other waste control methods; to the full extent of their legal capability, exercise control against diversion of streamflow available for water quality control; and, within statutory limits, adopt and enforce floodplain management regulations to guide future developments within the floodplain away from locations which are threatened by flood hazards to minimize future flood damages.

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SECTION II - PROJECT FORMULATION

5. NEEDS THAT POTENTIALLY CAN BE MET BY DEVELOPMENT OF WATER RESOURCES

A comprehensive study for the Genesee River Basin was authorized by the Committee on Public Works of the United States Senate in a resolution adopted 1 February 1962. In accordance with principles established by the Coordinating Committee for this study, the primary considerations were that future water resource development needs be identified in a general nature and scope, that detailed investigations sufficient for authorization be made only for Federal or Federally - assisted projects requiring initiation of construction within 10 to 15 years after study completion and that any investigation be terminated upon establishment that plan justification would not result. It was further concluded that project analysis under the Genesee River Basin study would be oriented to the primary criterion of economic efficiency.

The southern portion of the Genesee River Basin lies in the Appalachian Region. Projects considered under the Genesee River Basin study and lying within the Appalachian Region were considered under the Appalachian Study for both regional gains and national economic efficiency.

Under the Genesee River Basin study, needs capable of at least partial resolution by structural measures were found to be greatest for general outdoor and fish and wildlife recreation, electric power generation, supplemental irrigation, and stream pollution abatement. Also resolvable in some degree by structural measures are needs for control of sediment production and deposition, erosion of stream banks, and flood control.

The needs which could be met by the Stannard project on the Upper Genesee River are discussed briefly in the following paragraphs. (See also exhibit 10-4).

With the conservation pool of the considered Stannard Reservoir project at elevation 1620, available flood control storage to top of gates elevation 1622 would be 4,000 acre-feet during the summer months. Available storage during the remaining months would depend upon the seasonal drawdown. The available storage in the Stannard Reservoir project would significantly reduce the scale of flood damages expected to occur downstream in the absence of further flood protection, but will not completely eliminate the flood problem. Further, the project will increase the reliability of an existing local protective works, including a rectification of deficiencies, located downstream at Wellsville. The Stannard project would free for higher development uses desirable lands along the Genesee, downstream from the project site to Belmont.

Available streamflow, augmented by releases from the Stannard project would satisfy downstream water supply and water quality needs for a 100- to 125-ton per day capacity sulphate pulp and paper mill and for supplemental irrigation of approximately 5,800 acres located in Allegany County, New York. Daily flows of 95 cfs will be required by the proposed mill, assuming the equivalent of good secondary treatment. The 5,800 acres represents the

irrigable lands in the Genesee River valley in Allegany County. A strong interest has not been shown by the local farmers for this practice to date. However, as irrigation becomes economically feasible due to changing agriculture and other economic factors, this practice may become more applicable in the future. As the Appalachian plan should represent all interests and provide for the needs of the area, both present and future, it will be very desirable to allocate 5,800 acre-feet of storage for future irrigation needs. This storage could be used for other purposes such as recreation until the time when it is needed for agricultural purposes.

For 85 to 90 percent of the time, low flow requirements for the Genesee River reach below the Gates-Chili-Ogden treatment plant would be met by providing the flows required by the non-consumptive use of the proposed mill.

The need for water-based recreation opportunity in Sub-region F is expected to increase rapidly in the foreseeable future. Investigations by the Bureau of Outdoor Recreation reported in Appendix F, of the Report for Development of Water Resources in Appalachia, indicate that the need in recreation days in 1980 is 74.3 million; in 2000 is 176.6 million; and in 2020 is [illegible]08.4 million.

6. ALTERNATIVES AVAILABLE FOR MEETING THE NEEDS

Economy in the use of the Nation's resources requires that no funds be expended in the development of a plan which would provide benefits which could be provided at less cost by alternative means. This is in conformance with Senate Document No. 97, 87th Congress, entitled: "Policies, Standards, and Procedures in the Formulation, Evaluation, and Review of Plans for Use and Development of Water and Related Land Resources." The alternatives considered and the basis for selection of the structural alternative are discussed in the following paragraphs.

Structural - Under the Genesee River Basin study, reservoirs to be impounded by dams across the main river or tributaries were considered for providing needed acreages of water surfaces for general recreation, and for fish and wildlife habitat, and related recreational pursuits. Reservoirs were also considered as providing opportunities for conventional and/or pumped storage hydroelectric power development, for releases of impounded waters in time of need for water quality improvement and irrigation, for control of flood flows, and for the relatively minor domestic water supply needs not expected to be met by existing sources. Other structural measures, considered for capability to meet needs in particular resource areas, included developments adjacent to existing waters for water-oriented recreation, waste treatment facilities (including possible advanced treatment works), or facilities for diversion of wastes to improve surface water quality; bank protection works or channel improvement projects for erosion control; and local protection works, channel improvement or floodproofing structures for reduction of flood damages.

Non-structural - Under the Genesee River Basin study, non-structural measures considered were increased public access and/or removal of restrictions on existing water for general recreation, hunting and fishing; changed techniques in management of agricultural and forest lands, reforestation and associated land treatment measures; and flood plain zoning, flood warning and forecasting systems for flood damage reduction. Some of these non-structural measures are being recommended for implementation under the Genesee River Basin study and are complementary to the structural measures recommended. Non-structural measures would not provide a water supply needed for the regional expansion effects.

Basis for Selection of Structural Alternative*/ - Under the Genesee River Basin study, 14 major reservoir sites with potential multiple-purpose use were identified. The locations of these sites are shown on exhibit 10-2. Selection of sites for more detailed study was based on indicated feasibility, ability to provide substantial benefits for more than a single project purpose, and economy per unit of storage. On this basis, four of the 14 major sites were selected. Preliminary data for these four sites are shown in table 10-1. These sites were given a more detailed study including subsurface explorations and re-estimate of costs for several scales of development. Estimates of benefits were re-investigated to include multiple-purpose operations. The Angelica and Belfast sites were found economically unjustified based on tangible benefit evaluations for either single-purpose or multiple-purpose operation. The Stannard site was found to be marginal as a single-purpose recreation site only. The Stannard site was found to be economically feasible as a multiple-purpose project if future industrial water supply could be considered as a project purpose. The Portage site was found to be economically justified as a multiple-purpose reservoir providing benefits primarily from recreation and pumped storage power. The Portage site was considered under the Appalachian study but was not included in the final analyses as there is considerable local opposition to this site at the present time. The intense opposition is based on the very understandable desire of the inhabitants of the valley not to be displaced from their homes and livelihood. Accordingly, the Coordinating Committee for the Genesee River Basin study concluded that the Portage project should be deferred from being recommended as part of their early-action program. Dam and reservoir cost curves for these four sites are shown on exhibit 10-3.

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*/ For more complete information see Genesee River Basin Comprehensive Report, Volumes I and II.

TABLE 10-1
PRELIMINARY DATA, SELECTED RESERVOIRS

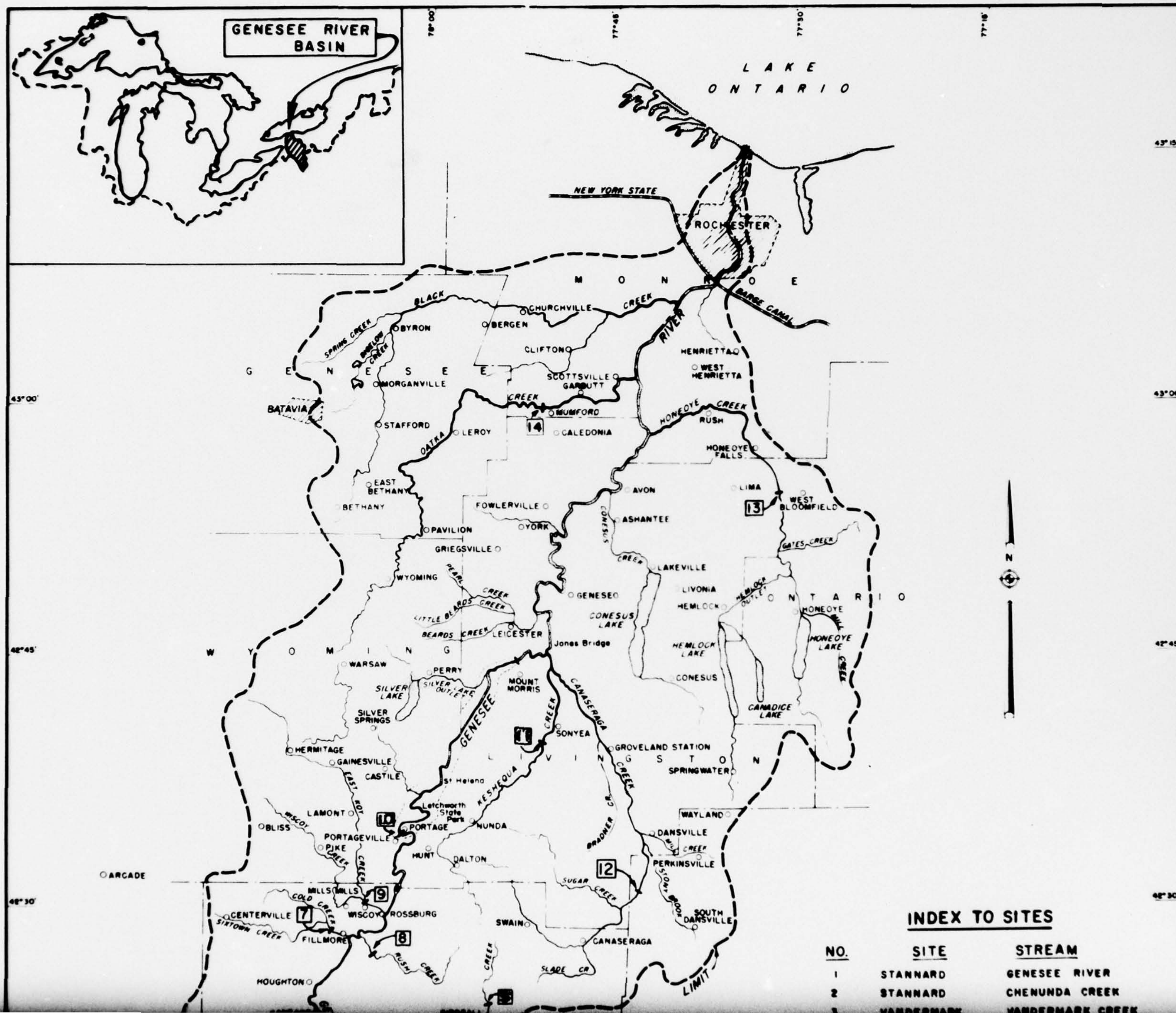
Site	Stream	D.A. (sq. mi.)	Max. Dam hgt. (ft.)	Storage Cap. (1000 Ac.-Ft.) Total	Storage Cap. Active	First Costs ($1000) Dam & Reservoir	First Costs Real Estate	First Costs Investment	Annual Charges (1) Total ($1000)	Annual Charges $ /Ac. ft.	Potential Average Annual Benefits ($1000) (2) Flood Control	Irrigation	Power	Water Quality (3)	Outdoor Recreation	Fish & Wildlife	Total	Total Benefit Cost Ratio (4)
Portage	Genesee R.	985	130	283.0	251.0	23,100	5,300	30,919	1,057.0	109	0	0	1,280.0	500.0	818.0	629.0	3,233.0	3.1
Stannard	Genesee R.	168	90	93.5	91.0	17,400	1,250	19,816	706.2	212	17.7	20.1	4.0	494.0	7.8	742.0	1,286.0	1.8
Belfast	Genesee R.	580	110	145.0	127.4	39,800	2,200	44,625	1,538.0	308	4.4	7.2	23.0	500.0	13.3	337.0	884.9	0.6
Angelica	Angelica Ck.	54	130	45.7	39.4	15,100	770	16,574	597.0	362	8.6	7.2	5.0	214.0	86.4	375.5	695.7	1.2

(1) Includes interest and amortization at 3 1/8 percent over 100-year period, engineering and design, supervision and administration, operation and maintenance.

(2) Maximum benefits, net of specific costs, obtained by single-purpose reservoir operations.

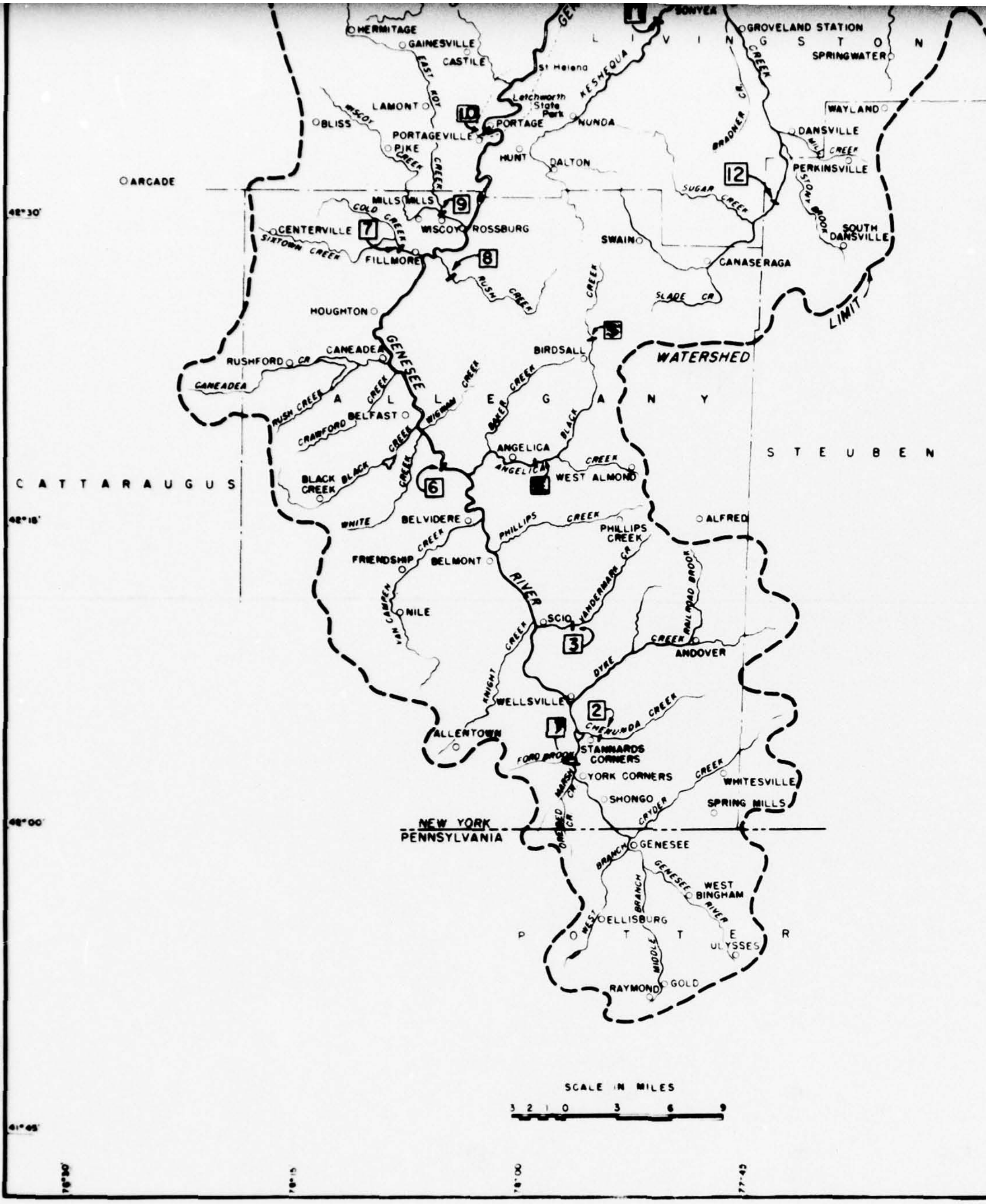
(3) Based on meeting portion of flow augmentation required for lower Genesee River below Court Street Dam in Rochester, and with potential benefits limited to cost of alternative waste treatment facilities.

(4) Total potential annual benefits ÷ total annual costs



INDEX TO SITES

NO.	SITE	STREAM
1	STANNARD	GENESEE RIVER
2	STANNARD	CHENUNDA CREEK



INDEX TO SITES

NO.	SITE	STREAM
1	STANNARD	GENESEE RIVER
2	STANNARD	CHENUNDA CREEK
3	VANDERMARK	VANDERMARK CREEK
4	ANGELICA	ANGELICA CREEK
5	SUMMIT	BLACK CREEK
6	BELFAST	GENESEE RIVER
7	COLD	COLD CREEK
8	RUSH	RUSH CREEK
9	WISCOY	WISCOY CREEK
10	PORTAGE	GENESEE RIVER
11	TUSCARORA	KESHEQUA CREEK
12	POAG'S HOLE	CANASERAGA
13	HONEOYE	HONEOYE CREEK
14	OATKA	OATKA CREEK

GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

MAJOR RESERVOIR SITES STUDIED

U S ARMY ENGINEER DISTRICT, BUFFALO

JUNE 1967

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EXHIBIT 10-2

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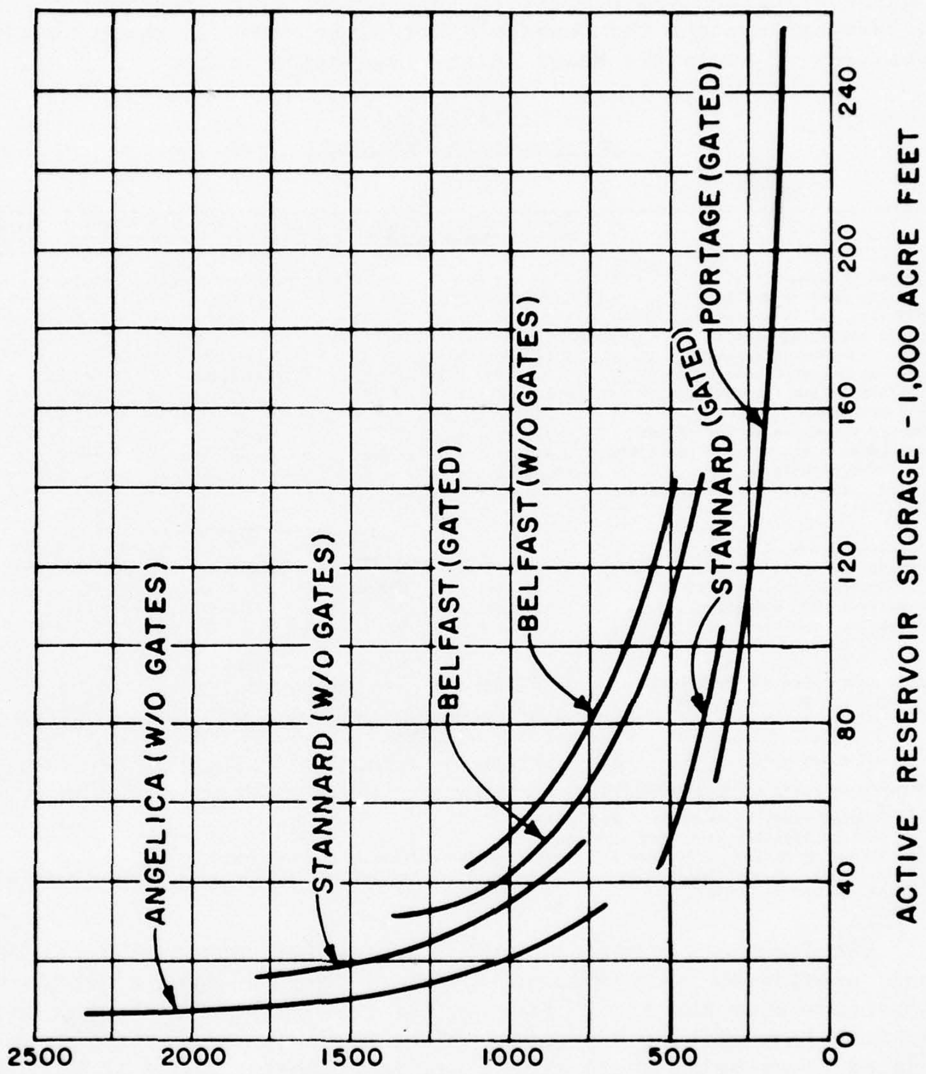
COMPOSITE COST OF STORAGE CURVES
(FIRST COST / A-F VS. ACTIVE STORAGE)



SOURCE: GENESSE COMPREHENSIVE BASIN REPORT

EXHIBIT 10-3

7. STANNARD RESERVOIR-DETAILED PROJECT FORMULATION STUDIES

After consideration of the topography of the Stannard Reservoir site, it was indicated that elevation 1625 would be about the maximum practicable water surface elevation. Water surfaces above this elevation would seriously affect Genesee, Pennsylvania. Reservoir capacities considered ranged from 18,500 acre-feet to 49,000 acre-feet with an uncontrolled spillway and from 49,000 acre-feet to 93,000 acre-feet with a gated structure. A summary of the project data prepared for the Stannard site under the Genesee River Basin study is shown in table 10-2. Estimates of costs are based on May 1967 price levels.

TABLE 10-2
PROJECT DATA, STANNARD SITE

	2" Storage (1)	3½" Storage (1)	5½" Storage (1)	9" Storage (2)	10½" Storage (2)
	Uncontrolled Spillway			Gated Spillway	
Type of structure	Earth dam, concrete overflow spillway				
Spillway crest elevation	1,576 ft	1,587 ft	1,598 ft	1,587 ft	1,593 ft
Effective spillway length	275 ft	275 ft	275 ft	275 ft	190 ft
Top of gates, elevation				1,614 ft	1,620 ft
Top of embankment elevation	1,609 ft	1,619 ft	1,630 ft	1,621 ft	1,630 ft
Spillway design discharge	135,000 cfs	127,000 cfs	125,200 cfs	143,000 cfs	116,000 cfs
Spillway design flood elevation	1,604 ft	1,614 ft	1,625 ft	1,616 ft	1,625 ft
Head on crest	28 ft	27 ft	27 ft	29 ft	32 ft
Channel elevation at toe of dam	1,533 ft	1,533 ft	1,533 ft	1,533 ft	1,533 ft
Max probable tailwater elevation	1,558 ft	1,558 ft	1,558 ft	1,559 ft	1,554 ft
Area of outlet works	240 sq ft	240 sq ft	240 sq ft	240 sq ft	240 sq ft
Top of Marsh Creek dike elevation	1,609 ft	1,619 ft	1,630 ft	1,621 ft	1,630 ft
Reservoir area and capacity					
Capacity, top of gates				81,000 A-ft	93,000 A-ft
Capacity, spillway crest	18,500 A-ft	31,000 A-ft	49,000 A-ft	31,000 A-ft	39,000 A-ft
Pool area, spillway crest	1,000 acres	1,400 acres	1,700 acres	1,400 acres	1,500 acres
Sediment pool elevation	1,550 ft	1,550 ft	1,551 ft	1,551 ft	1,551 ft
Capacity, sediment pool	1,800 A-ft	1,800 A-ft	1,900 A-ft	1,900 A-ft	2,000 A-ft
Project Costs					
First cost: Dam and reservoir	$ 27,800,000	$ 30,900,000	$ 37,310,000	$ 30,060,000	$ 31,750,000
Real estate (3)	950,000	1,100,000	1,290,000	1,540,000	1,600,000
Total first cost	$ 28,750,000	$ 32,000,000	$ 38,600,000	$ 31,600,000	$ 33,350,000
Annual charges (4)	$ 1,070,000	$ 1,180,000	$ 1,410,000	$ 1,130,000	$ 1,190,000

(1) Storage capacity below spillway crest.
(2) Storage capacity below top of gates.
(3) Including estimated minimum lands required for recreational development.
(4) Interest and amortization on investment at 3 1/8 percent for 100-year life, plus operation and maintenance of dam and reservoir.

Flood control benefits, while largest for any major sites considered, could provide an average annual total of only $31,000 in damage reduction downstream from the site. Storage for this purpose could not be justified. Benefits from meeting a portion of the water quality requirement in the Genesee River below Court Street Dam in Rochester could total $315,000 annually, based on costs of the advanced treatment alternative, if 50,000 acre-feet of reservoir storage could be drawn upon without consideration of recreation requirements and provided that additional and approximately equal storage were available to meet the total water quality requirement. The Court Street Dam is located approximately eight miles above the mouth of the

Genesee River. No feasible site to provide the additional storage was found except for the Portage project determined to be best operated without the required storage being allocated to quality improvement. The Portage Reservoir site is located approximately 85 miles from the mouth of the Genesee River. Fish and wildlife benefits were estimated by the U.S. Fish and Wildlife Service at $790,000 from an annual use by 150,000 visitors on a pool area of 1,500 acres and contingent upon control of reservoir drawdown during the recreation season. The general outdoor recreation task group for the Genesee River Basin study was opposed to development of the site primarily because of adverse effects upon white-water canoeing on upper reaches of the river during the spring runoff period. For plans of development involving relatively severe drawdown during the recreation season, outdoor recreation benefits were estimated by the Bureau of Outdoor Recreation at about $77,500 from 155,000 visitor-days annually. Maximum potential was estimated by the Corps of Engineers at $225,000 from annual visitation by 340,000 recreationists. Operated primarily for water quality and fish and wildlife purposes, Stannard Reservoir could provide minor power benefits of about $7,000 annually through reduced requirements for pumping energy at the considered Portage project. The project was assumed to be operated to increase dependable low flow from a 30-day average discharge of about 7 cfs under existing conditions to about 20 cfs with the project. No estimates were made for tangible benefits which might accrue through this increase.

Under the Genesee River Basin study the three dams designed with uncontrolled spillways were evaluated assuming single-purpose operation for recreation including fish and wildlife enhancement and using benefits as estimated by the Corps of Engineers. In addition, a structure with crest gate control and providing storage equivalent to that in the ungated structure was also evaluated. Results of these analyses are summarized in table 10-3.

TABLE 10-3
STANNARD SITE, RECREATION ONLY

	Storage-inches on drainage area			
	2"	3½"	5½"	5½"
	- - - uncontrolled - -			Gated
Top of gates el.-ft.	-	-	-	1,598
Capacity-acre-ft.	-	-	-	49,000
Spillway crest el.-ft.	1,576	1,587	1,598	1,571
Capacity-acre-ft.	18,500	31,000	49,000	14,000
Min.recreation pool el.-ft. 1/	1,570	1,582	1,595	1,595
Max.recreation pool el.-ft.	1,576	1,587	1,598	1,598
Pool area-acres	1,000	1,400	1,700	1,700
Recreation-1,000 visitor-days	200	280	340	340
Annual benefits-$1,000	150	182	255	255
Fishing-1,000 fisherman-days	100	140	170	170
Annual benefits-$1,000	493	694	852	852
Total benefits-$1,000	643	876	1,107	1,107
Annual charges, dam & reservoir-$1,000	1,070	1,180	1,410	880
Annual charges, recr.facilities-$1,000	94	132	161	161
Total annual charges-$1,000	1,164	1,312	1,571	1,041
Benefit-cost ratio	0.6	0.7	0.7	1.06

1/ Based on 6,000 acre-ft. for minimum dependable release of 20 cfs.

Under the Genesee River Basin study the gated structure providing 9 inches of storage was evaluated as a project for recreation and low flow augmentation for water quality control. The structure with 10½ inches of storage was evaluated for recreation and industrial water supply. Each project would provide minor benefits if pumped storage power was developed at the Portage site. Results of these analyses are summarized in table 10-4.

TABLE 10-4
STANNARD SITE, MULTIPLE-PURPOSE PLANS

	Storage-inches on drainage area 9"	10½"
Top of gates el.-ft.	1,614	1,620
Capacity-acre-ft.	81,000	93,000
Spillway crest el.-ft.	1,587	1,593
Capacity-acre-ft.	31,000	39,000
Water quality storage-acre-ft. 1/	56,000	-
Water supply storage-acre-ft. 1/	-	66,000
Joint use pool el.-ft.	1,614	1,620
Min. recreation pool el.-ft.	1,582	1,584
Pool area - acres	1,200	1,280
Recreation-1,000 visitor-days	155	155
Annual benefits-$1,000	78	78
Fishing-1,000 fisherman-days	120	128
Annual benefits-$1,000	588	630
Water quality benefits-$1,000	315	-
Water supply benefits-$1,000	-	1,040
Power benefits-$1,000	7	7
Total annual benefits-$1,000	988	1,755
Annual charges, dam & reser. - $1,000	1,145	1,190
Annual charges, recr.facilities- $1,000	86	86
Total annual charges-$1,000	1,231	1,276
Benefit-cost ratio	0.8	1.3

1/ Includes losses.

The previous analyses established the relative merit and potential of the Stannard site using alternative scales of development and project purposes. A 3 1/8 percent interest rate was used in these analyses. Further study of this site was not made under the Genesee River Basin study as a project could not be justified under the regular Corps criteria.

Under the Appalachian study, the Stannard site was selected for survey scope study mainly because of its potential as a base for expanding industrial development in the Wellsville growth center. Studies made by the

State of New York*/ indicated that construction of a dam and reservoir at this location would make available the missing critical site requirement - water - needed to make a pulp and paper mill viable in southern Allegany County.

With a conservation pool at elevation 1620, 10-1/2 inches of storage could be maintained for recreation, water supply, water quality and irrigation with 35-foot tainter gates. A study of the freeboard of the Mount Morris Reservoir, located approximately 67 miles above the mouth of the Genesee River, and other reservoirs in the vicinity indicated that a five-foot freeboard on the proposed Stannard Reservoir would be adequate. A capacity of 4,000 acre-feet would always be available for flood control storage by utilizing two feet on the gates, over and above the conservation pool elevation of 1620.

Several computer runs were made of flow routings through the proposed Stannard project, based on the 58 years of record. Average monthly flows were routed with varying parameters depending on the requirements for each run. A minimum storage of approximately 25,000 acre-feet was maintained. Reservoir drawdown versus frequency curves and frequency of flow (at Scio) curves were plotted, by months, for each computer run over the period of record. The effects of reservoir drawdown on recreation and fishery benefits for the critical months of the year were estimated as described in Section V of this chapter. Benefit evaluations for the various plans are shown in table 10-5. Schematic diagram of needs which could be met by Stannard Reservoir is shown in exhibit 10-4.

The economic feasibility of providing flows from a multiple-purpose project to meet the total water quality requirements below the Gates-Chili-Ogden treatment plant was based on the additional costs of providing storage in a separate, single-purpose reservoir to supplement downstream flows required for the proposed mill. This storage requirement was based on a comparison of flow requirements between plan B1 and plan B5. A comparison of the annual costs of a separate, single-purpose reservoir against a net loss in upstream benefits indicated that additional releases from the multiple-purpose project for this purpose would be more economical.

In making the final selection of a plan, it was assumed that the plans under consideration would have the same annual costs so that it was a matter of selecting the plan that would provide the greatest benefits and also optimize the at-site benefits of the reservoir. Plan E1 was selected over plan E2 as there is less drawdown during the critical recreation months.

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*/ For detailed information see the report, "Economic Potential of Stannard Dam and Reservoir as Site for Pulp and Paper Mill" prepared by Division of Water Resources, New York State Conservation Department, Exhibit 10-13.

TABLE 10-5

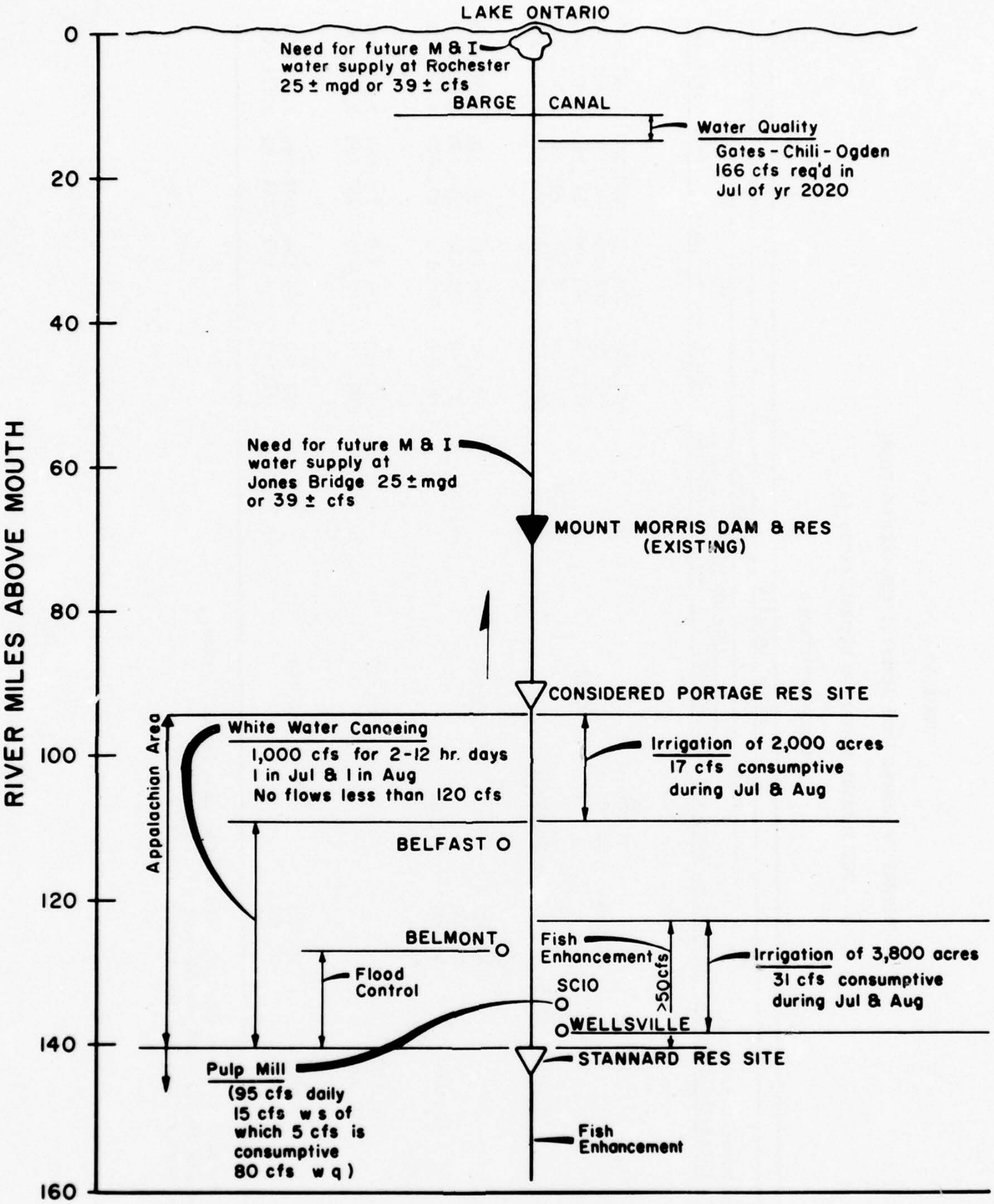
SUMMARY OF ANNUAL USER BENEFITS FOR VARIOUS PLANS

PRELIMINARY SCREENING WITHOUT FLOOD (1)

STANNARD RESERVOIR

Plan	Pulp Mill 95 cfs at Scio $	Water quality at Gates-Chili-Ogden $	Irrigation $	Recreation: Canoeing $	Recreation: Canoeing with 2-1,000 DSF (2) $	Recreation: Canoeing with 4-1,000 DSF (3) $	Recreation: Fishing $	Recreation: General recreation $	Recreation: Access sites $	Total (4) $
B										
1	838,000			58,960			601,450	212,580	250,580	1,962,000
2	838,000		56,000	58,160			596,500	208,060	247,180	2,004,000
3	838,000				64,160		593,210	204,200	272,680	1,972,000
4	838,000					69,520	584,410	195,170	295,460	1,983,000
5	838,000	101,000		59,440			601,440	210,860	252,620	2,063,000
C										
1	838,000		56,000		63,840		588,260	196,890	271,320	2,014,000
2	838,000		56,000			69,200	574,240	190,010	294,100	2,022,000
3	838,000	101,000	56,000	59,200			596,500	205,490	251,600	2,108,000
D										
1	838,000	101,000			64,720		592,100	202,910	275,060	2,074,000
2	838,000	101,000				70,000	582,210	193,450	297,500	2,082,000
E										
1	838,000	101,000	56,000		64,160		587,600	195,500	272,680	2,115,000
2	838,000	101,000	56,000			69,280	573,560	189,150	294,440	2,121,000

(1) Specific allocated flood control storage is the same for all plans.
(2) One 12-hour day in July and one 12-hour day in August.
(3) Two 12-hour days in July and two 12-hour days in August.
(4) Rounded.



GENESEE RIVER BASIN
FLOW NEEDS WHICH COULD BE MET
BY
STANNARD RESERVOIR

EXHIBIT 10-4

The various plans evaluated to this point of analyses excluded consideration of the flood control function since potential benefits from any other function would be more than twice that of flood control. To evaluate flood control alternatives for the objective of developmental opportunities discussed in sections IV and V of this chapter, preliminary cost estimates were made for providing complete protection from the 100-year flood occurrence on about 640 acres of flood plain along the upper Genesee River by the following methods.

Plan 1 - Containing the 100-year flood at the Stannard site, on top of the summer recreation pool at elevation 1620.

Plan 2 - Utilizing the flood control storage in the reservoir as presently formulated and adding levees downstream.

Plan 3 - By use of downstream levees only.

For each of the alternatives, it was assumed that some channel enlargement would be feasible. Channel improvements with or without the reservoir were not evaluated because of possible adverse effects on downstream fishing and canoeing.

Under Plan 1, it was assumed that the channel downstream of the reservoir site could be enlarged so as to pass 3,000 cfs within the channel banks. It was determined that approximately 33,500 acre-feet of storage would be required in the reservoir, over and above pool elevation 1622. Extending the area-capacity curve for the reservoir, the elevation required to meet this storage was found to be 1634. Top of dam was assumed to be at elevation 1640, an increase of ten feet over the height of the selected project. It was determined that in addition to the incremental costs of raising the dam and Marsh Creek levee by ten feet, approximately 2½ miles of levee with an average height of eight feet would have to be constructed to protect Genesee, Pennsylvania. This levee height would include a six-foot freeboard. A preliminary estimate of the incremental first costs and annual charges under Plan 1 were found to be about $3,907,000 and $140,000 respectively.

Under Plan 2, 4,000 acre-feet of storage is always available at no specific costs to flood control. For complete protection downstream from the 100-year flood, approximately 13 miles of levees at an average height of six feet would be required. This levee height includes a three-foot freeboard. A preliminary estimate of the first costs, including pumping plants for internal drainage, was found to be about $2,800,000. Annual charges would be about $104,000.

Under Plan 3, the 100-year flood would be completely contained by 13 miles of levees with an average height of eight feet including a three-foot freeboard. The estimated first costs of this levee system, including pumping plants for internal drainage, were about $4,000,000. Annual charges would be about $148,000.

Based on the above preliminary estimates, the least costly alternative for providing complete protection from the 100-year flood occurrence would be the Stannard Reservoir as formulated with downstream levees constructed as needed. Construction of the proposed multiple-purpose Stannard Reservoir would be compatible with any future water resource project constructed in the Genesee River Basin. With the Portage project in the system, the downstream water quality benefits at Gates-Chili-Ogden would accrue to this project and the Stannard project could provide minor power benefits through reduced requirements for pumping energy at the Portage project.

The Stannard project operation would frequently result in drawdown of the conservation pool. Based on the storage requirements for water supply, water quality, recreation, and irrigation, an analysis of the drawdown frequency was made, month by month, for the period of streamflow record, 1909 through 1966. Table 10-6 displays drawdown during the major recreation season and exhibit 10-5 shows the drawdown by months for various frequencies. A five-foot drawdown would occur once in 20 years during the month of July, once in 2.5 years during the month of August, once in two years during the month of September, and once in two years during the month of October.

8. SELECTED PROJECT

The Stannard Reservoir area is shown on exhibit 10-1. Plan and details are shown on exhibit 10-6. The structure would be an earth dam with concrete overflow spillway section creating a reservoir four to eight miles long with surface area at full pool of approximately 2,300 acres. To prevent overflow through the Marsh Creek Valley, it would be necessary to construct a levee approximately 2.7 miles upstream from the confluence of Marsh Creek and the Genesee River.

The project would reduce the flood damages downstream, between the site and Belmont, by approximately 70 percent. It would meet the needs for a proposed pulp and paper mill in the vicinity of Scio for water supply and water quality control. Water quality needs would also be met downstream at Gates-Chili-Ogden. The project would assure a water supply for supplemental irrigation in Allegany County. It would also provide a reservoir surface and adjacent recreation areas to satisfy a portion of the water-based recreation needs in the area adjoining the project, both in and out of the Appalachian Region. It was assumed that the pulp and paper industry would treat its wastes and disperse its effluent in a suitable manner, compatible to the other uses of the project.

TABLE 10-6
RECREATION SEASON DRAWDOWN

	Drawdown, in feet, below top of conservation pool level, elev. 1620, at end of month noted					Drawdown, in feet, below top of conservation pool level, elev. 1620, at end of month noted			
Year	May	June	July	August	Year	May	June	July	August
1909	0	0	3	7	1941	0	0	2	5
1910	0	0	2	5	1942	0	0	0	0
					1943	0	0	2	5
1911	0	0	3	2	1944	0	0	1	5
1912	0	0	4	6	1945	0	0	0	1
1913	0	0	3	6					
1914	0	0	4	7	1946	0	0	0	0
1915	0	1	0	0	1947	0	0	0	0
					1948	0	0	1	2
1916	0	0	0	3	1949	0	0	3	7
1917	0	0	0	0	1950	0	0	2	5
1918	0	0	2	9					
1919	0	0	0	0	1951	0	0	0	3
1920	0	0	0	0	1952	0	0	3	6
					1953	0	0	1	4
1921	0	0	0	2	1954	0	0	3	7
1922	0	0	0	0	1955	0	1	6	8
1923	0	0	2	6					
1924	0	0	0	3	1956	0	0	0	0
1925	0	0	2	4	1957	0	0	2	6
					1958	0	0	0	1
1926	0	0	3	6	1959	0	0	3	7
1927	0	0	2	5	1960	0	0	1	4
1928	0	0	0	1					
1929	0	0	0	3	1961	0	0	1	2
1930	0	0	2	6	1962	0	0	3	7
					1963	0	0	2	5
1931	0	0	0	2	1964	0	0	4	7
1932	0	0	2	6	1965	0	0	3	7
1933	0	0	1	2	1966	0	0	3	7
1934	0	1	5	10					
1935	0	0	0	0					
1936	0	1	4	8					
1937	0	0	2	1					
1938	0	0	1	5					
1939	0	1	5	9					
1940	0	0	1	4					

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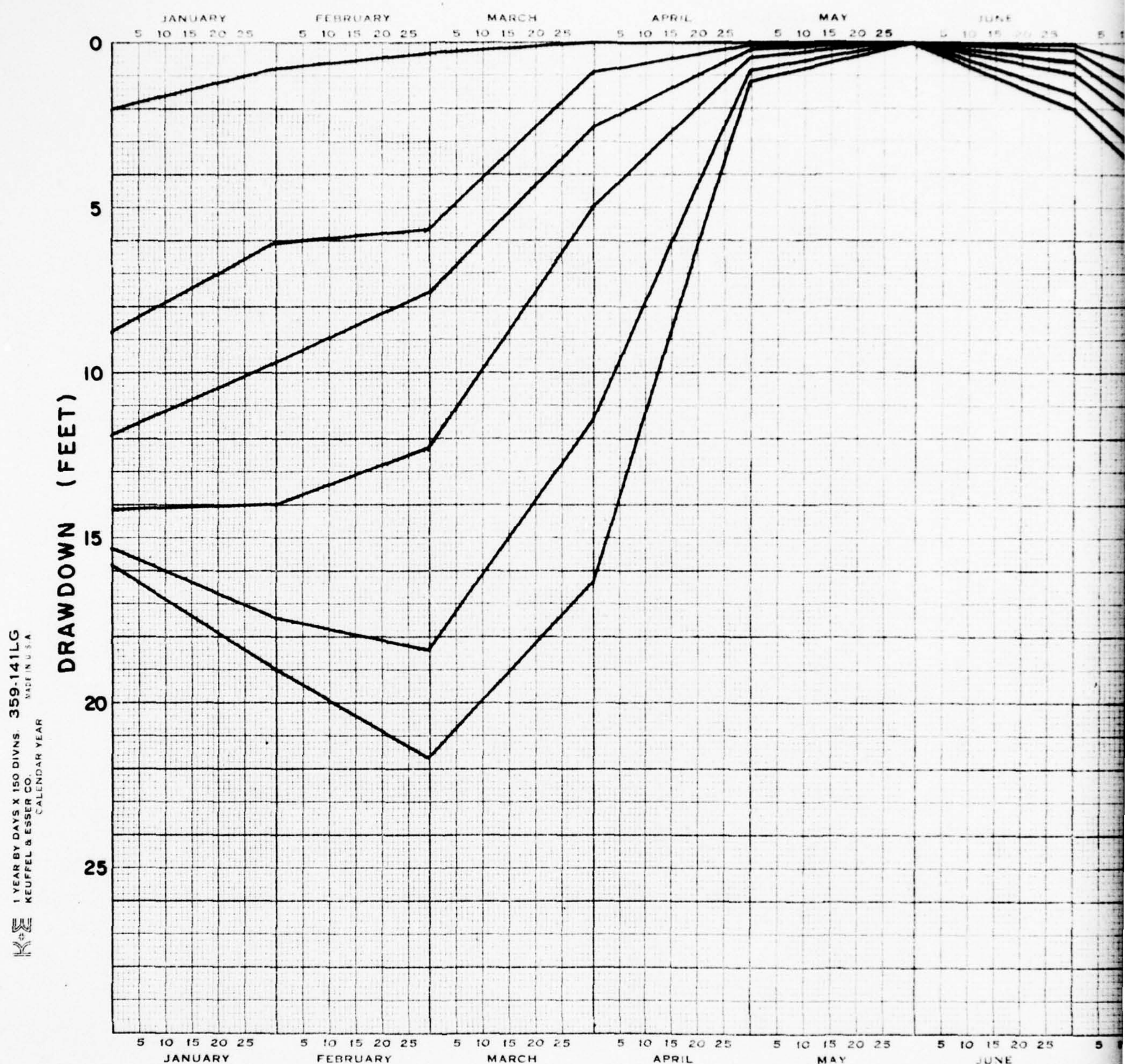
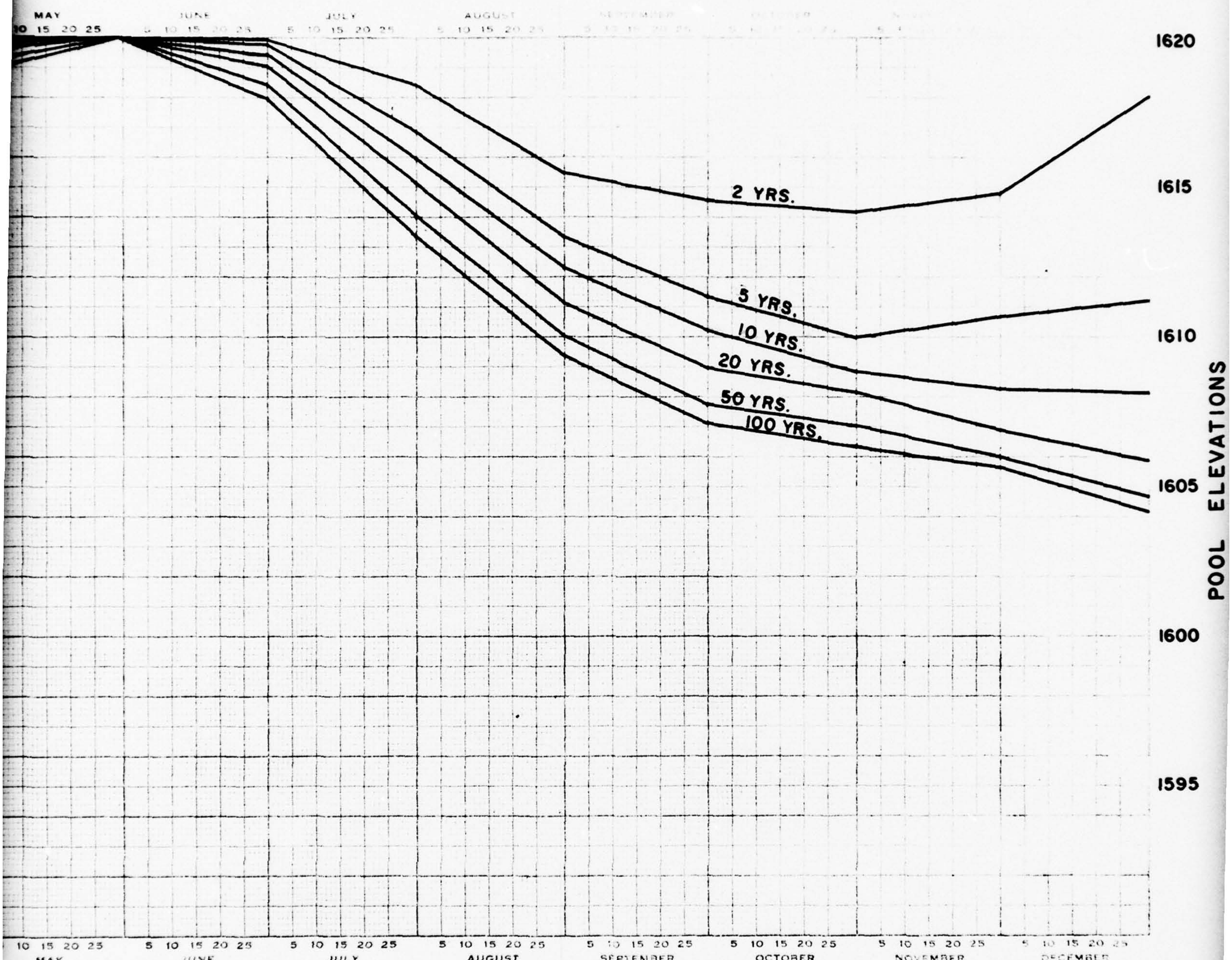


RESERVOIR DRAWDOWN



RESERVOIR DRAWDOWN FOR PLAN E-1

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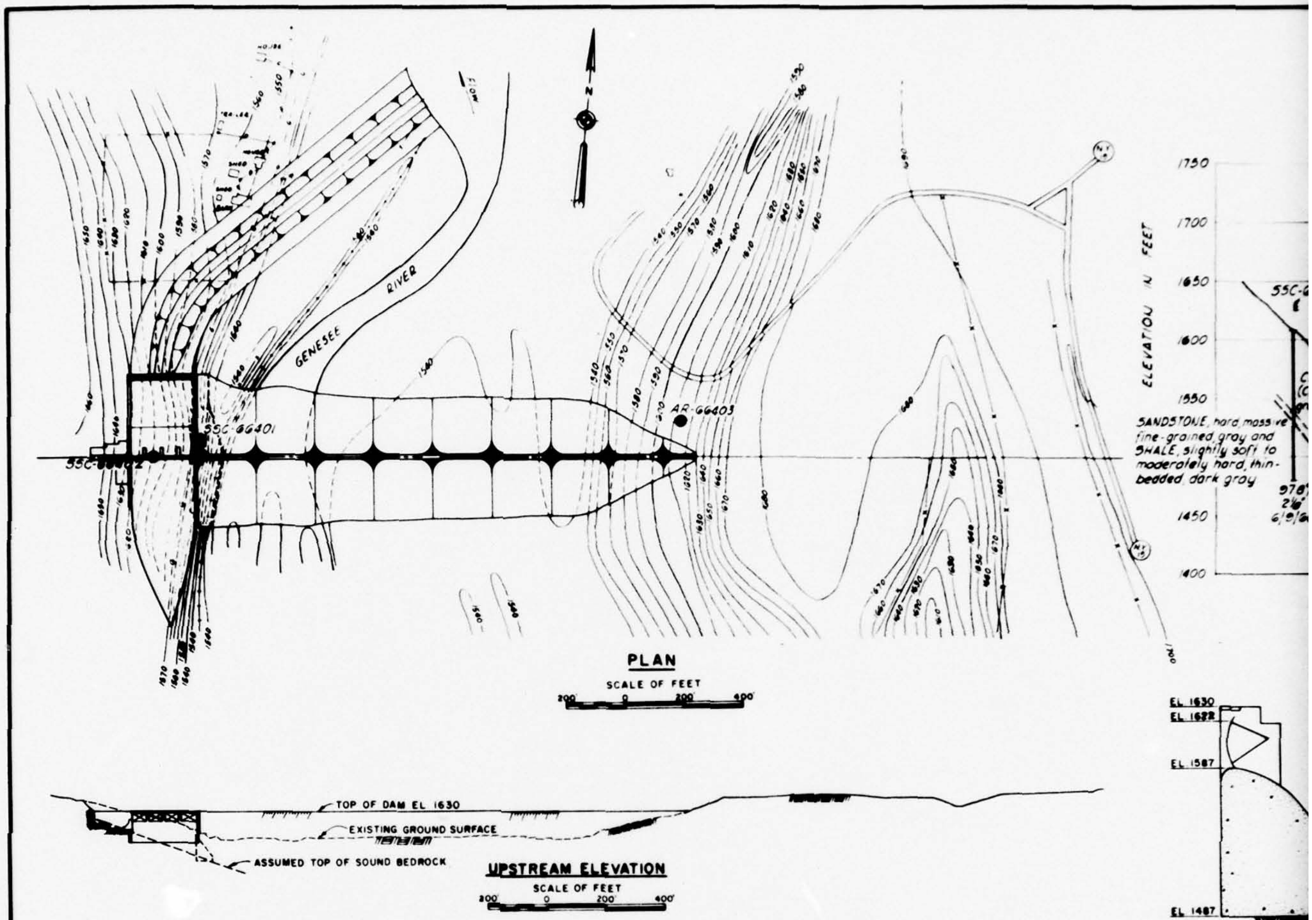
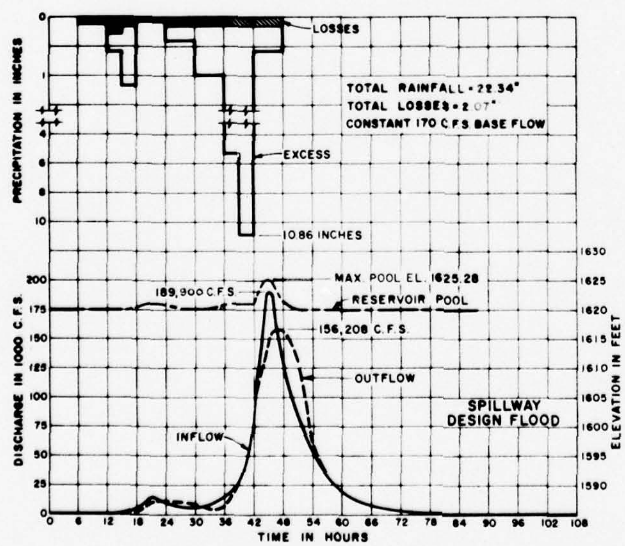
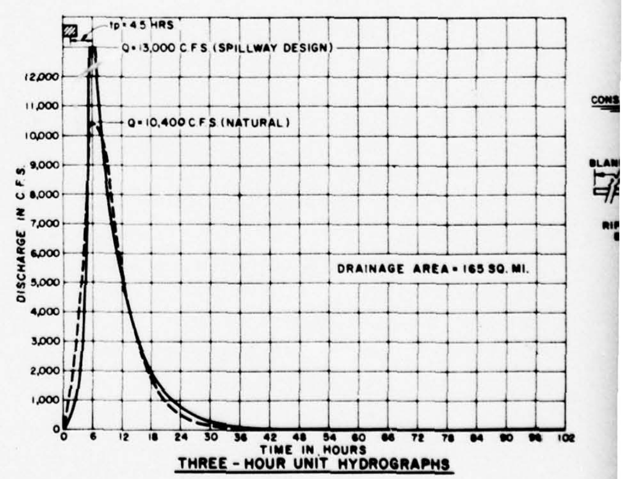
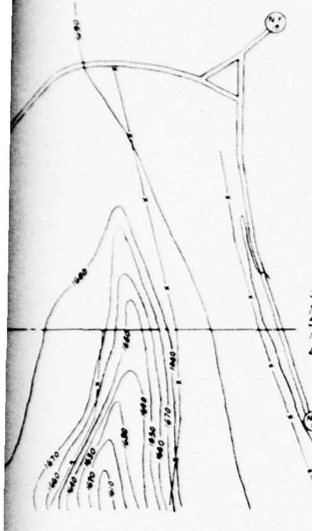
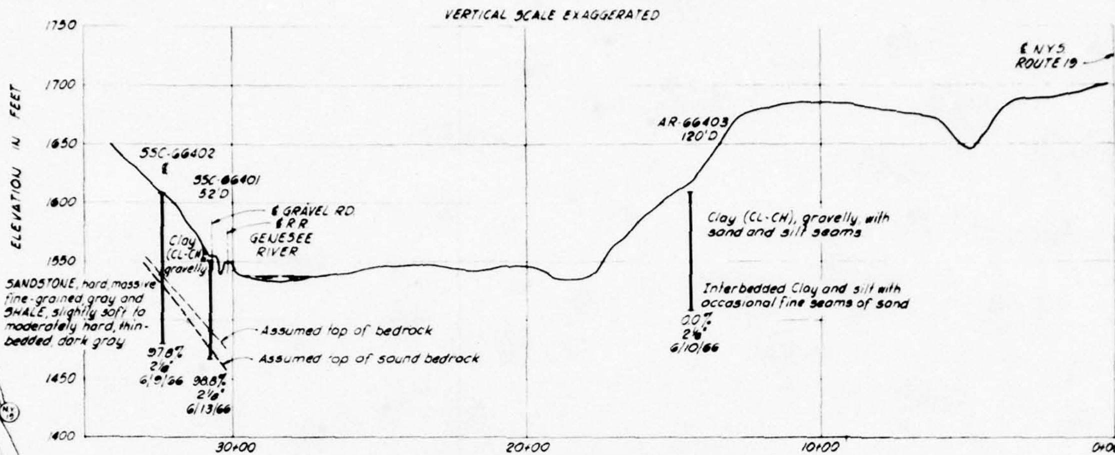


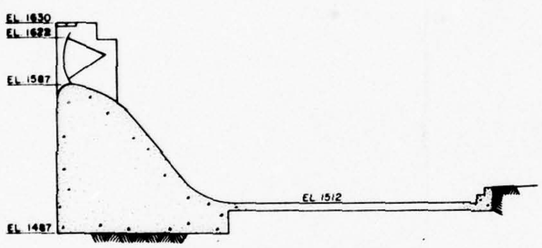








GEOLOGIC PROFILE AT DAMSITE



CONCRETE SPILLWAY SECTION

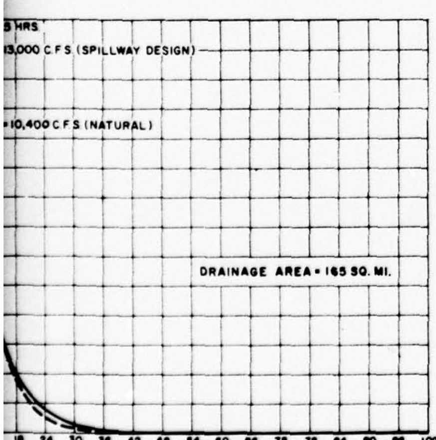
SCALE OF FEET
40' 0 40' 80'

LEGEND FOR EXPLORATIONS:

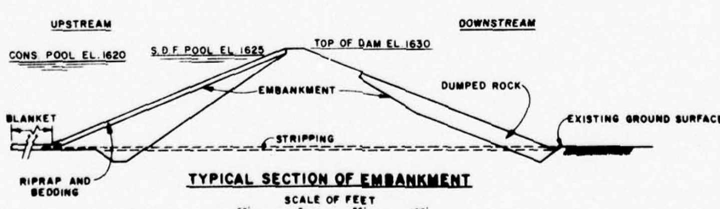
HOLE NUMBER AND DESIGNATION — C-66302
*OFFSET — ℄
TOP OF HOLE
ASSUMED TOP OF BEDROCK
BOTTOM OF HOLE
PERCENT CORE RECOVERED IN BEDROCK — 94.3%
DIAMETER OF BEDROCK CORE — 2 1/8"
DATE EXPLORATION COMPLETED — 6/2/66

*OFFSET FROM PROFILE OR SECTION MAY BE UPSTREAM OR DOWNSTREAM (U OR D) AS DEFINED

TYPE OF EXPLORATION CODE DESIGNATION	
C	CORE HOLE
AR	AUGER AND/OR ROCKBIT HOLE
SS	SPLIT SPOON SAMPLE
●	VERTICAL EXPLORATION



THREE - HOUR UNIT HYDROGRAPHS



TYPICAL SECTION OF EMBANKMENT

SCALE OF FEET
50' 0 50' 100'

GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

STANNARD DAM
PLAN AND DETAILS

U.S. ARMY ENGINEER DISTRICT, BUFFALO
JUNE 1968

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SECTION III - DESIGN CONSIDERATIONS

9. HYDROLOGIC

Hydrology and hydraulic design data for the Stannard Reservoir project are discussed in the following paragraphs. Additional information is given in Volume IV, Appendix E, of the Genesee River Basin report.

General Climatology - The climate of the Genesee River Basin south of Wellsville is temperate. The prevailing wind is from the west. The average annual temperature of the area is about 45.4 degrees Fahrenheit and the average annual precipitation, including snow, is 36.2 inches.

Storms - Damaging floods on the Genesee Basin have occurred in all months of the year except August. Summer floods are, in general, localized in a part of the basin and are usually the result of convectively unstable air condition. Winter and spring floods are the result of frontal precipitation on saturated or frozen ground or on melting snow cover.

Major Experienced Storms - The flood producing storms in the upper Genesee River Basin for which meteorologic data are available are listed in table 10-7. The preponderance of heavy-rainfall storms are on the upper basin.

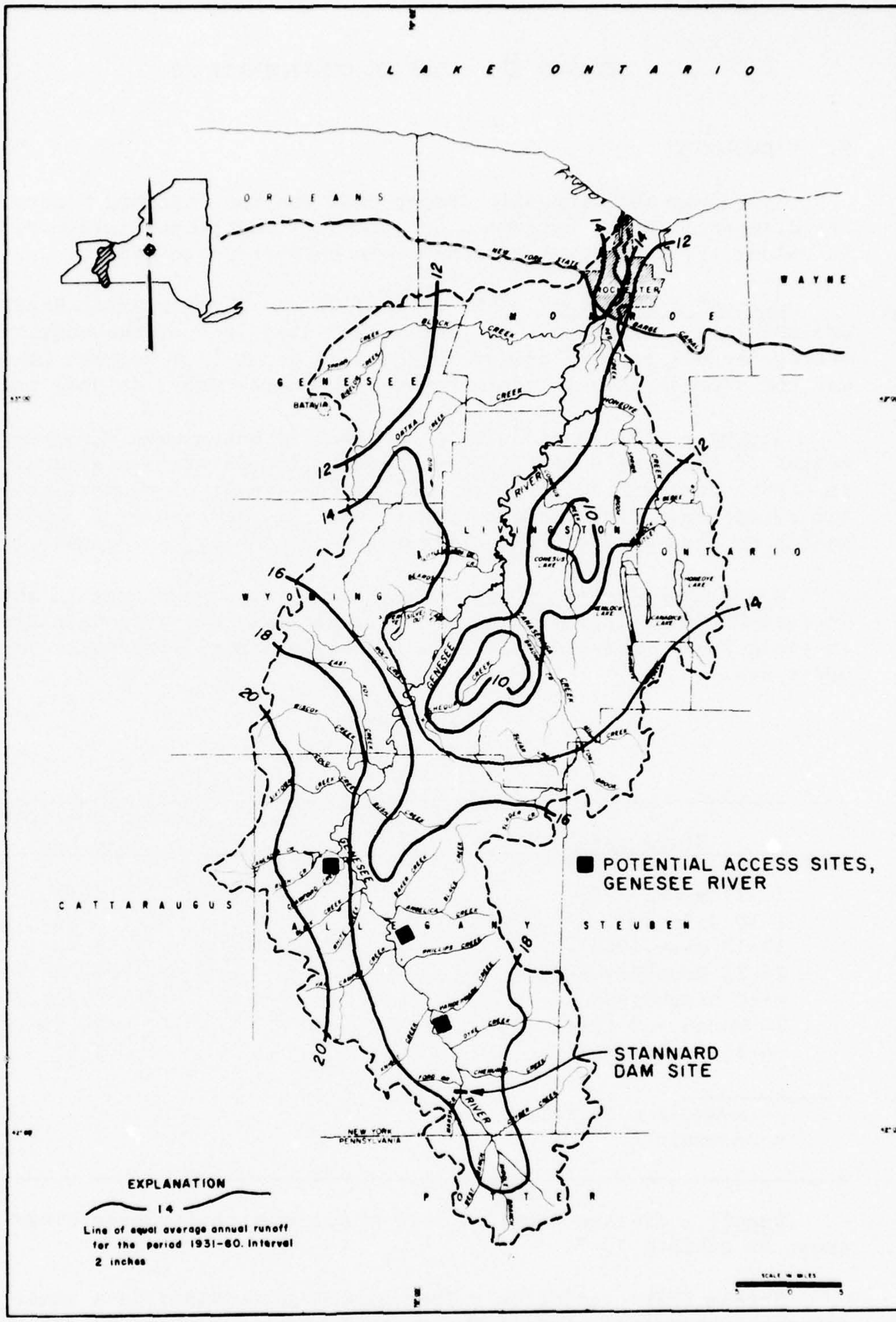
TABLE 10-7
STORMS OF RECORD

Storm period	Average precipitation (inches)
23-27 March 1913	4.93
7-10 July 1935	5.86
17-18 July 1942	3.83
24-25 November 1950	2.24
6-10 March 1956	3.20+
29 March - 2 April 1960	3.30*
24-26 April 1961	2.47

+ Snowmelt plus rainfall
* Snowmelt

Runoff - Average annual runoff throughout the Genesee River Basin is shown on exhibit 10-7.

Stream Characteristics - The upper Genesee River is a steep gradient stream. Characteristics of the upper Genesee are shown in table 10-8.



Map of average annual runoff in the Genesee River basin

TABLE 10-8
STREAM CHARACTERISTICS

Location	Drainage area above location (square miles)	Miles above mouth	River-bed elevation (feet)	Average slope (feet/mile)
Belmont	-	126.9	1359	-
Scio gage	309	132.8	1438	13.4
Wellsville (Dyke Creek)	288	137.7	1479	8.4
N.Y. - Pa. boundary	96	148.8	1615	12.3
Source	0	156.5	2400	101.9

Storage Allocation to Proposed Purposes - The proposed Stannard Reservoir project was designed to provide for sediment deposit, water supply, water quality control, irrigation, canoeing, recreation, and flood control. The reservoir segments, including an allowance for evaporation, apportioned to the various project functions at full conservation pool are shown in the following tabulation:

Function	Capacity (acre-feet)
Sediment	2,000
Water supply	4,300
Water quality control 1/	40,900
Irrigation	6,400
Canoeing	6,400
Recreation	33,500
Flood control	4,000
Total	97,500

1/ FWPCA has raised questions concerning the magnitude of flows required for quality control, associated storage requirements, and benefits to be credited to this purpose. Therefore, a complete reappraisal of this aspect of the project will be made in connection with detailed engineering studies to follow.

Conservation Storage Versus Yield - An evaluation of the present and projected flow requirements for water supply and water quality control is discussed in Volume V, Appendix H of the Genesee River Basin report. Studies show that the Stannard project would meet dilution and other water requirements discussed below.

Maintenance of Stream Quality - Critical stream sectors on the Genesee River are the Avon, Gates-Chili-Ogden, and the Kodak sectors, located approximately 36, 14, and 4 miles respectively, above the mouth

of the Genesee River. The Kodak sector, as shown in table 10-9, has the greatest gross dilution requirement. The average monthly gross dilution or upstream flow requirements for adequate assimilation of projected waste loadings in each of the critical stream sectors is shown in table 10-9. These are the total streamflows that must be made available throughout the month specified in order to maintain DO desired in each stream sector. Eighty-five percent treatment was assumed, the minimum degree of treatment, until the year 1980; 90 percent or better was assumed necessary after that time. The Genesee River at the Gates-Chili-Ogden sector does not require substantial amounts of streamflow until the year 2020 when more than 160 cfs is needed during the month of July. These needs would be met by the Stannard project. For the reach of the Genesee River below Avon, the 1980 and 2020 streamflow requirements in July are both nearly 90 cfs. Although this is a substantial flow for this reach of the river during the summer months, latest studies by Federal Water Pollution Control Administration show that natural flows would meet these requirements. Therefore, low flow augmentation for the Avon sector is not required.

Hydropower - Studies have revealed no economical possibilities for the development of hydropower at the Stannard Reservoir site.

Water Supply - The Stannard Reservoir project would assure daily flows of 95 cfs for the proposed pulp and paper mill. Of the 95 cfs flow, 15 cfs was considered as water supply of which 5 cfs would be consumptive. The remainder, 80 cfs, was considered to be used for low flow augmentation. The project would assure a water supply of 48 cfs during July and August for supplemental irrigation of approximately 5,800 acres in Allegany County.

The Stannard Reservoir project is under consideration as a source of downstream water supply. Future demands downstream were assumed by the Buffalo District, Corps of Engineers. Two computer runs were made with the selected plan E1 plus the provision of approximately 25 mgd at Rochester and the combination of plan E1 plus the provision of 25 mgd at Rochester and 25 mgd at Jones Bridge. The city of Rochester is located at the mouth of the Genesee River and Jones Bridge is located approximately 62 miles above the mouth of the Genesee River. (See exhibit 10-4.) Based on the procedure discussed in Section V of this chapter for evaluating benefits, the provision of 25 mgd at Rochester would have no appreciable effect on the upstream benefits. The provision of 25 mgd at both Rochester and Jones Bridge would decrease the at-site reservoir recreation and fishing annual benefits by $10,000 and increase the annual benefits downstream for canoeing and small access sites by approximately $5,000.

TABLE 10-9
GROSS STREAM FLOW REQUIREMENTS
FOR CRITICAL STREAM SECTORS - GENESEE RIVER BASIN

Stream sector	Year	D.O. goal mg/1	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average monthly flow
Genesee River	1965	4	130	130	160	180	340	530	660	630	630	440	260	160	360
Kodak	1980	4	200	200	230	270	510	800	980	940	940	660	390	240	530
	2020	4	180	180	210	250	490	780	970	930	930	640	380	220	510
Genesee River	1965	4	3	3	4	4	13	20	25	24	24	17	8	4	12
Gates-Chili-	1980	4	18	18	22	26	57	85	106	101	101	70	40	23	55
Ogden	2020	4	26	26	30	38	82	134	166	158	158	110	62	34	85
Genesee River	1965	4	20	20	25	29	53	69	81	81	81	57	37	23	48
Avon	1980	4	20	20	25	29	57	77	93	89	89	61	41	29	52
	2020	4	20	20	25	29	53	73	89	89	89	61	41	26	51

Sediment - The basic assumption for an individual reservoir is that in a given period, a specific reservoir would entrap the percentage of total sediment inflow corresponding to the trap efficiency at a specific storage and the remainder would pass downstream. The given storage would be reduced by the volume of the sediment entrapped and the storage would be the initial value for the next time period. A curve showing accumulated storage loss versus time for the Stannard Reservoir is shown on exhibit 10-8. The curve shows that a 100-year accumulated storage loss would amount to 2.1 percent of the total storage available at the elevation of 1620 which is the conservation pool level. This is the equivalent of 11.9 acre-feet of storage loss per square mile of area.

Recreation - The project would provide a water supply to meet weekend flows of 1,000 cfs for two weekends of canoeing, one each in the months of July and August. No flows during July and August would be less than 120 cfs. The non-consumptive flow required by the mill of 90 cfs would be part of the 120 cfs.

Area and Capacity - Area-capacity curves were obtained with the use of U.S.G.S. quadrangle maps which were available at a scale of 1:24,000. With a planimeter, areas within each contour were computed. Knowing the contour intervals, the volume of the reservoir could be determined. The area-capacity curve for the Stannard Reservoir is shown on exhibit 10-1.

Standard Project Flood - A standard project flood determination was made for the Stannard site. The determination of the standard project flood was computed with the Corps of Engineers Computer program 23-J2-L228, "Unit Graph and Hydrograph Computation," prepared by the Hydrologic Engineering Center, Sacramento. From the standard project storm rainfall, an initial loss of 0.5 inch and an infiltration loss of 0.05 inch per hour were subtracted to give an excess that was applied to the three-hour unitgraph. Base flow for the basin was assumed to be a constant value of 165 cfs. The peak discharge was 84,400 cfs or 512 cfs per square mile. A plot of the standard project flood hydrograph is shown on exhibit 10-9.

Spillway Design Flood - The maximum probable precipitation amounts as determined from U.S. Weather Bureau Hydrometeorological Report 33 were used to determine rainfall for calculating the spillway design flood. A unitgraph was determined for reservoir conditions at the considered site. The peak of the unitgraph was increased 25 percent and the maximum probable rainfall (decreased by appropriate losses) was applied to the unitgraph to develop the spillway design flood hydrograph. The rainfall was reduced in accordance with recommendations in EC-110-2-27 and losses were taken as 0.5 inch initial loss and 0.05 inch per hour infiltration. A plot of the maximum probable flood hydrograph is shown on exhibit 10-6.

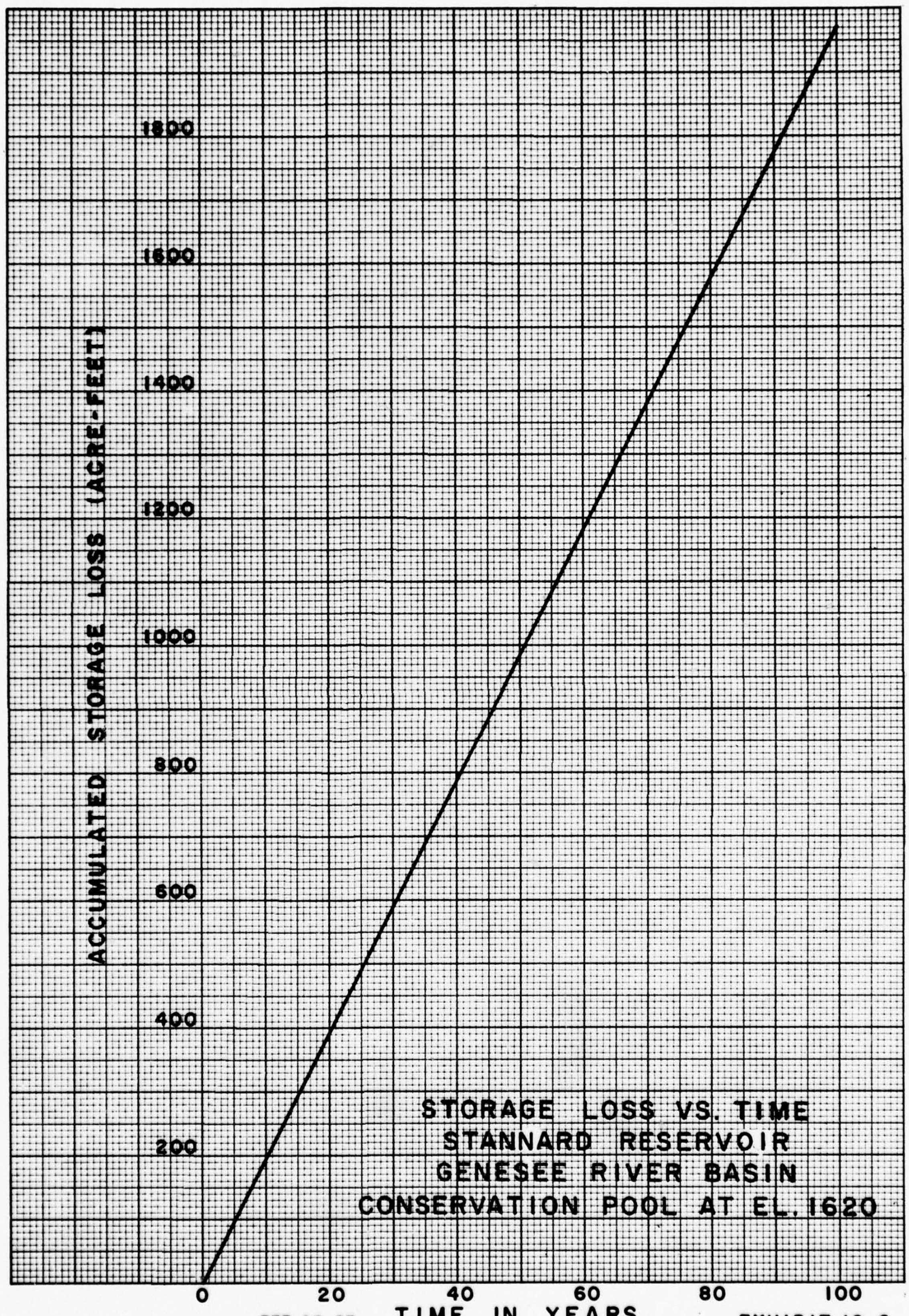
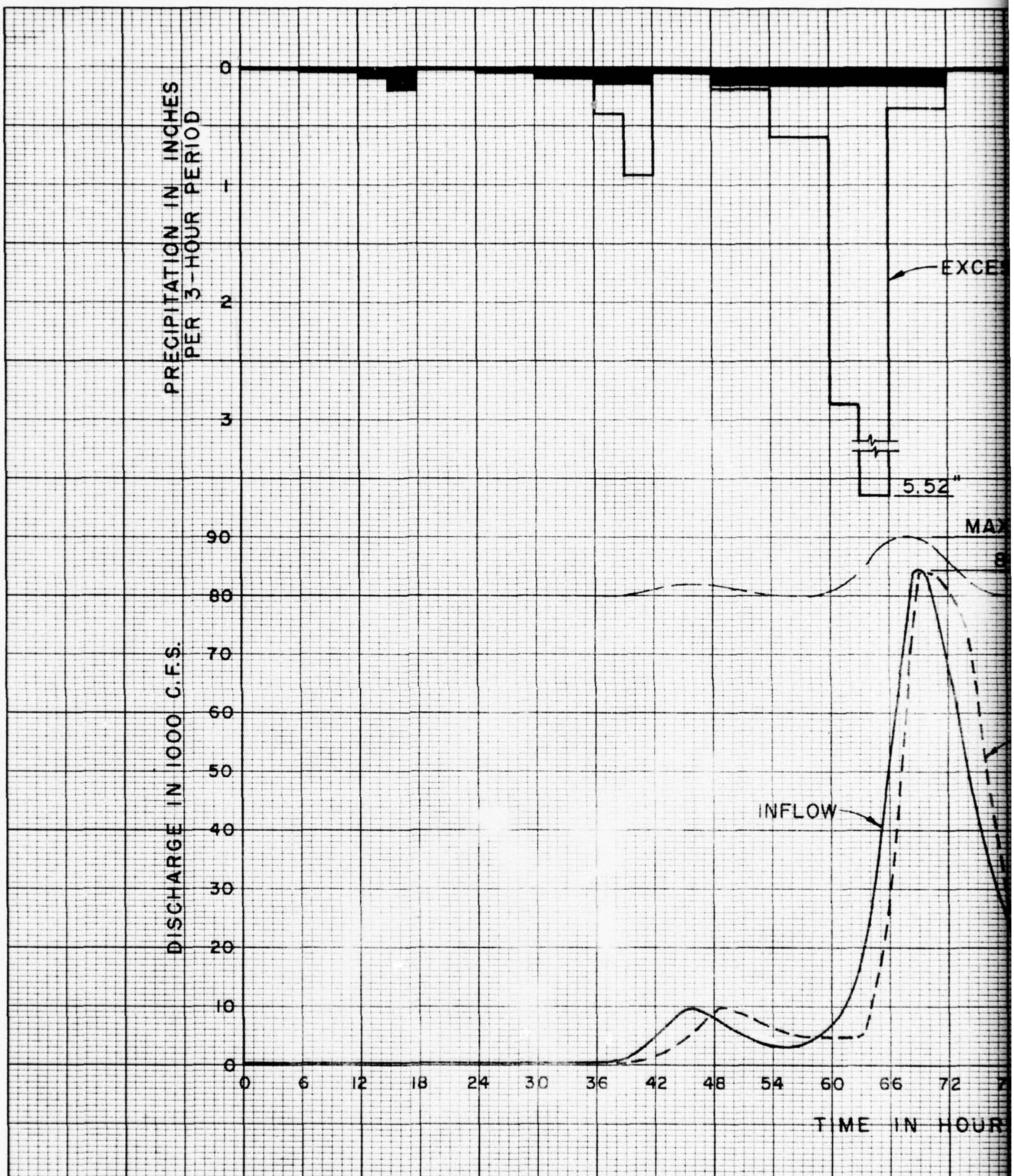

ACCUMULATED STORAGE LOSS (ACRE-FEET)
1800
1600
1400
1200
1000
800
600
400
200
STORAGE LOSS VS. TIME
STANNARD RESERVOIR
GENESEE RIVER BASIN
CONSERVATION POOL AT EL. 1620
0
20
40
60
80
100
TIME IN YEARS

EXHIBIT 10-8

Spillway Width versus Embankment Height - A study of the freeboard of the Mount Morris Reservoir and other reservoirs in the vicinity indicated that a freeboard of five feet would be adequate. Controlling topography, elevation 1630, minus the freeboard requirements dictated the maximum water surface allowable for the spillway design flood, elevation 1625. Subsurface conditions at the damsite made a narrow spillway at the left abutment necessary, therefore, the spillway length was set at 190 feet. Knowing the maximum water surface allowable and the length of spillway, the spillway crest elevation was determined by trial. The spillway design flood was routed through a range of spillway crest elevations to determine the maximum crest that would pass the spillway design flood without exceeding the maximum pool elevation of 1625 feet. The spillway crest elevation was thereby established at elevation 1587.

Flood Routing Conditions - The routing procedure for the spillway design flood began on the ninth hour of the maximum probable storm and with an assumed full reservoir pool elevation of 1620. Since this routing was for design purposes and the most severe conditions were desired, the outlet works were considered inoperative. Routings for both the maximum probable and standard project floods were accomplished with the Corps of Engineers computer program 22-J2-L210, "Spillway Rating and Flood Routing", prepared by the Hydrologic Engineering Center, Sacramento. The initial flood routing conditions for the standard project flood included a starting pool elevation of 1620 and the routing procedure was started at the 36th hour or the beginning of appreciable runoff. Gate regulation was done by the computer program in accordance with the Corps of Engineers EM 1110-2-3600 and is discussed in the computer manual for program 22-J2-L210. Gate regulations were made so that an induced surcharge of five feet would be realized. Outlet works discharge would depend on flows from the local area between the damsite and Stannards Corners. To determine the flow from the local area, the standard project storm was centered on the 210 square mile area above Stannards Corners. The runoff from this situation was applied to unitgraphs for the Chenunda Creek and Ford Brook drainage areas which comprise the local area. The locations of these streams are shown on exhibit 10-7. Since the two streams enter the river just upstream from the index point at Stannards Corners, it was not considered necessary to route the local flows. The peak discharges from the local area would be 23,430 cfs. Flows of this magnitude alone would cause considerable damage at Stannards Corners since zero damage is at a discharge of 3,600 cfs. To keep flows at the beginning of the storm below zero damage, outlet works discharge from the reservoir would be held at 500 cfs. Adequate facilities would be provided to accomplish this.

Flood Routing Results - Routings for both the maximum probable flood and standard project flood were initiated at full pool, elevation 1620. The spillway design discharge was 156,200 cfs from an inflow of 189,860 cfs. The result of the maximum probable flood routing is shown on exhibit 10-6. The control of the standard project flood was negligible. During the routing the peak outflow equaled the peak inflow. Exhibit 10-9 shows the result of the standard project flood routing.



PRECIPITATION IN INCHES PER 3-HOUR PERIOD
EXCE
5.52"
MAX
DISCHARGE IN 1000 C.F.S.
INFLOW
TIME IN HOUR

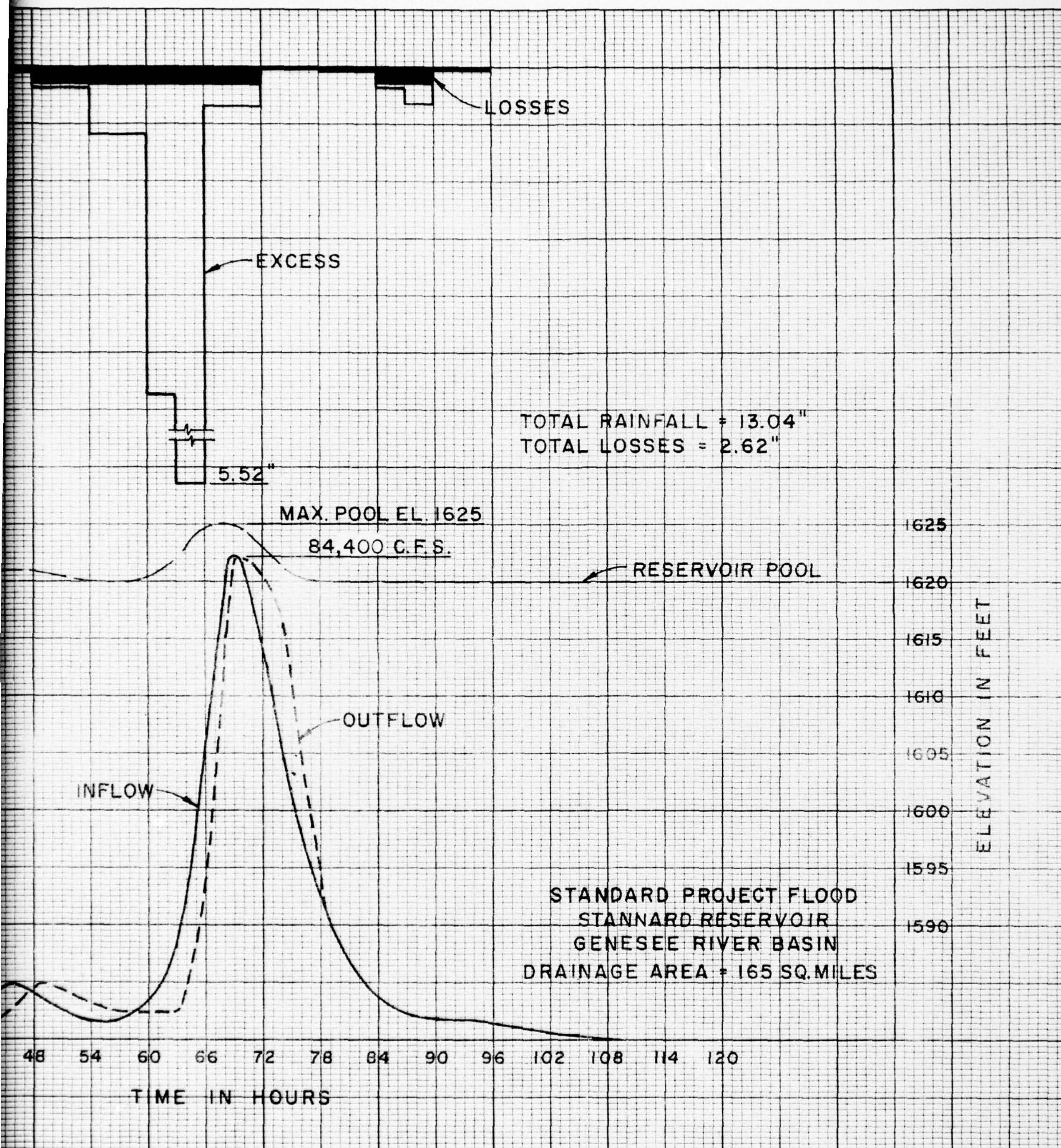

LOSSES
EXCESS
TOTAL RAINFALL = 13.04"
TOTAL LOSSES = 2.62"
5.52"
MAX. POOL EL. 1625
84,400 C.F.S.
RESERVOIR POOL
1625
1620
1615
1610
1605
1600
1595
1590
ELEVATION IN FEET
OUTFLOW
INFLOW
STANDARD PROJECT FLOOD
STANNARD RESERVOIR
GENESEE RIVER BASIN
DRAINAGE AREA = 165 SQ. MILES
48
54
60
66
72
78
84
90
96
102
108
114
120
TIME IN HOURS

EXHIBIT 10-9

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10. GEOLOGIC

Surrounding Area Description - The area surrounding the reservoir is a part of the Allegheny Plateau region of the Appalachian Province.

The Stannard Reservoir site is located on the upper Genesee River in Allegany County, New York, beginning about four miles south of Wellsville. It lies principally within Allegany County and extends southward into Potter County, Pennsylvania.

The dominant physical features of the area are the narrow valleys with moderate to steep, wooded hillsides of the Allegheny Plateau. The area is sparsely populated except for the village of Wellsville, population approximately 6,000. The area is generally covered by forest except for an occasional small farm. There are some producing oil wells in the area.

The area is characterized by a broad main valley at elevation of 1,000 to 2,000 feet above mean sea level, rising to the south, separated by ridges rising 500 feet and more above the valley floor. The tributary streams are mainly north flowing with a steep gradient and narrow valleys.

Area Geology - The geologic studies for the proposed Stannard Reservoir and Genesee Basin consisted of a review of the geologic literature of the basin, brief reconnaissance survey at the damsite, and limited explorations.

The region of the Genesee River Basin includes a portion of the Central Lowlands physiographic province and the highlands of the Glaciated Allegheny Plateau section of the Appalachian Plateaus province. The north edge of the plateau is called the Portage escarpment. The land surface slopes gently toward the north ranging from about 2,500 feet at the southern limit to about 246 feet at the Lake Ontario shoreline. The surface features consist of a series of terraces named the Erie, Huron, and Ontario plains which are separated by northwest-facing escarpments named the Onondaga, and Niagara escarpments. As a result, the outcrop belts are in an east-west direction across the area with the more resistant formations marking the low but sometimes abrupt escaprments. The bedrock consists of Middle Paleozoic (Ordovician, Silurian, and Devonian) age sedimentary formations - shales, siltstones, limestones, and dolomites. The strata dip southward between 40 and 60 feet per mile and have been only slightly disturbed by orogenic forces. It appears that the crustal folding that took place in northern Pennsylvania during the Appalachian Revolution in the Permian time continued into the Genesee River Basin as minor anticlines and synclines.

The advance and recession of the Pleistocene glaciers changed the drainage patterns of western New York. In the Genesee River Basin area stream channels were filled by glacial debris which caused blockages of flow in the existing channel in some areas and resulted in some new stream channels being formed. An example of a very young valley in the Genesee River Basin formed as a result of glacial blockage is the Portage Canyon downstream of Portageville. The former channel east of Portageville is now filled with glacial debris.

General Project Description - The Stannard project site is located on the Genesee River about four miles south of Wellsville, New York and two miles south of the hamlet of Stannards Corners.

The damsite is across the Genesee Valley in a restricted area just downstream of the confluence of Marsh Creek and the Genesee River. This would form a two-forked reservoir. The minor fork would be in a southwest direction up Marsh Creek. A levee would have to be constructed on this fork to prevent water from entering the Allegheny drainage area. The major fork would be in a southeast direction up the Genesee Valley and would cross into Pennsylvania. The valleys narrow rapidly as they go upstream or south from the damsite. There are approximately 32 farms scattered throughout the reservoir area. The remaining land is mainly forest covered.

The damsite is located where the Genesee Valley narrows from approximately one mile to 2,000 feet. The surface of the reservoir is characterized by the two forks with steep, wooded hills rising from the pool. The low divide on Marsh Creek between the Genesee and Allegheny drainage is a governing factor limiting the height of the dam. The small streams entering the pool are steep and narrow.

Site Geology - A geological section along the axis of the dam is shown on exhibit 10-6. The width of the valley, the depth to bedrock in the main valley section and the lack of rock in the right abutment dictated a rolled-earth, riprap protected dam.

A reinforced concrete spillway would be located on the left abutment where it would be founded on sound bedrock. The outlet would be located with the spillway to use the sound bedrock. The approach and exit channels would be located in rock with the exception of the lower portion of the exit channel which is in overburden.

The levee on Marsh Creek would be a standard levee with a 10-foot top width and 1,600 feet in length. An impervious blanket would be provided to control seepage. No foundation explorations were made at the levee site.

Subsurface Investigations - Investigations were limited to the dam site and only three borings were made due to the lack of funds. There were no previous investigations at the site. Well driller's logs in the general area were the only previous data available.

At the reservoir site, two NX core borings and one NX rockbit boring were drilled by the Mobile District, Corps of Engineers in June 1966. The borings are located along or adjacent to the proposed dam axis and are shown on exhibit 10-6.

On the left abutment the overburden is approximately 60 to 70 feet in depth. On the right abutment the overburden was penetrated about 100 feet without contacting rock. The soil materials consist of gravelly clays, underlain with stratified, thick-bedded clay and silt.

Foundation Determinations - The initial drilling indicates that the left abutment is the most suitable location for the concrete spillway and outlet works structure founded on rock. The proposed structure would be supported by hard, massive, fine-grained, gray sandstone and slightly soft to moderately hard, thin-bedded, slightly jointed dark gray shale. The borings indicate that sound rock is from 74 to 78 feet below the ground surface in the vicinity of the proposed structure. Moderate water losses during drilling indicate that grouting will be required in the left abutment for the structure.

Reservoir Conditions - No geologic investigations were made in the reservoir area.

Construction Materials - Random and impervious fill is available in the general vicinity of the site as well as run-of-bank gravel. It is believed that riprap is available from quarries in the general vicinity. In the past, a quarry at Jasper, New York, has been approved as a source of riprap. Sources of concrete aggregates are Stafford, LeRoy, Rochester and Buffalo. A quarry at State College, Pennsylvania, which supplied aggregates for Allegheny Dam is also a potential source of materials. The distances of these quarries from the damsite range from 30 to 150 miles.

Mineral Resources Affected - The reservoir would not adversely affect any known mines, quarries, or wells, and no known mineral resources are likely to be lost as a result of construction of this project. A detailed report covering this subject and prepared by the Bureau of Mines is included in Appendix I of the Report for Development of Water Resources in Appalachia.

Conclusions - In summary, the subsurface explorations indicate that the left abutment is a suitable location for a concrete spillway structure founded on rock. Based on the description of overburden materials at the three boring locations, it appears that the impervious, gravelly clay foundation is well suited to found the dam embankment on. It is believed that underseepage would be of minor concern. However, additional subsurface explorations would be necessary to make a positive determination of the degree of protection necessary to prevent piping along possible pervious seams.

As geologic studies by the Buffalo District, Corps of Engineers have been restricted to the vicinity of the damsite as a result of a lack of funds, no evaluation has been made of the suitability of the reservoir as to the problem of leakage.

11. STRUCTURAL

The proposed rolled earth, riprap-protected embankment would have a length of 2,300 feet and would rise about 90 feet above the valley floor. The crown width at top elevation of 1630 would be 20 feet. The reinforced concrete spillway would be regulated by four radial gates which would be 47.5 feet long by 35 feet high and would be supported by three piers, ten feet wide. The stilling basin would be founded on rock. The outlet works would consist of five conduits, each controlled by two slide gates. One gate would be in reserve for emergency closure. Assuming the tainter gates inoperative and based on staying within the capacity of the channel below the damsite, the drawdown of the reservoir from elevation 1622 to elevation 1620 could be accomplished in half a day. It takes approximately eight days to draw down from elevation 1620 to elevation 1587 and four more days to empty the reservoir.

To prevent overflow through the Marsh Creek Valley, it would be necessary to construct a levee approximately 2.7 miles upstream from the confluence of Marsh Creek and the Genesee River. The levee would be approximately 1,600 feet long with a top width of ten feet at a crest elevation of 1630. Slopes would be 1 vertical on 2.5 horizontal. An impervious blanket would be provided to control seepage.

The features of the plan of improvement are summarized in table 10-10. The reservoir area and capacity curves are shown on exhibit 10-1. A general plan of the dam, elevations and sections are shown on exhibit 10-6.

TABLE 10-10
PERTINENT DATA
STANNARD RESERVOIR PROJECT

Reservoir	
Maximum W.S. elevation (spillway design flood pool)	1625
Maximum controlling topography, elevation	1630
Drainage area, sq. mi.	165
Conservation pool, elevation	1620
Pool area at maximum W.S., ac.	2,440
Pool area at conservation pool, ac.	2,330
Channel elevation at toe of dam	1531
Total capacity at conservation pool, ac.-ft.	93,500
Dam	
Top of dam, elevation	1630
Top width, ft.	20
Height of dam, ft.	99
Length, ft.	2,300
Spillway	
Number of gates	4
Size of gates, ft.	47.5 x 35
Top of gates, elevation	1622
Crest elevation	1587
Length (effective), ft.	190
Maximum head on crest (design), ft.	38
Design discharge, cfs	156,200
Outlet works	
Number of conduits	5
Size of each conduit, sq. ft.	48
Stilling basin	
Length, ft.	200
Bottom width, ft. (based on assumed pier width)	220
Elevation of bottom	1512
Elevation of end sill	1526
Levee	
Top of levee, elevation	1630
Top width, ft.	10
Height of levee, ft.	50
Sideslopes	1V on 2.5 H

12. RELOCATIONS

The Stannard Reservoir project would necessitate the relocation of the following:

3.1 miles of 14-inch high pressure gasline
3.1 miles of 20-inch high pressure gasline
1.2 miles of 6-inch high pressure gasline
4.3 miles of 4800-volt transmission lines
4.7 miles of heavy duty road
4.5 miles of medium duty road
8 miles of railroad
2 cemeteries (450 graves)

Relocations are shown on exhibit 10-1.

13. REAL ESTATE

Estimated land requirements for Stannard Reservoir up to elevation 1625 would be 2,440 acres which would include five feet vertical or a 300-foot strip horizontally, whichever is greater, around the reservoir. Additional lands for recreation would include a 500-acre site and a 50-acre site. At the time of the 1966 survey, the reservoir would require the acquisition of the following buildings:

30 residences, total assessed value = $76,900
32 farm units, total assessed value = 53,800
3 commercial, total assessed value = 9,700
2 churches, total assessed value = 11,300

The equalization rate for the Town of Willing is 0.42.

14. RECREATION FACILITIES

It is anticipated that a wide variety of recreation activities would be accommodated. These activities are as follows:

Bicycling	Nature walks
Boating	Outdoor games and sports
Camping	Picnicking
Driving for pleasure	Sailing and canoeing
Fishing	Sightseeing
Hiking	Swimming
Horseback riding	Walking for pleasure
Hunting	Water skiing

Recreation-Environmental Influences - The Genesee River and its tributaries in the headwater section and in the area of the dam provide outstanding trout fishing. Brown trout are the predominant species. Existing fish populations are supplemented by a stocking program carried out by the New York State Conservation Department, Division of Fish and Game, from Belmont, New York to the Pennsylvania line. Rainbow trout are also present in

lesser numbers. The 1968 stocking recommendation is for 12,000 brown trout yearlings and 7,200 rainbow trout yearlings in the section from Wellsville, New York to the Pennsylvania line. Although this section of river is primarily a coldwater fishing stream, smallmouth bass are present in limited numbers. Special regulations are in effect which allow anglers to keep any size and any number of bass which are caught during the trout season. The State of New York has leasing arrangements or perpetual easements along the stretch of the main stem Genesee to be inundated by the reservoir.

Several good tributary trout streams enter the Genesee downstream of the reservoir site. Among these are Cryder Creek, Dyke Creek, Marsh Creek, and Chenuda Creek. However, the majority of these streams suffer from low flows and warm water during the summer months.

Most bottom-land areas in the upper reaches of the Genesee River Basin are of only moderate productivity for farm-game species. Many of these same areas are in pastures or some form of farmland, and have only limited value as forest game habitat.

Deer are also abundant in the upper section of the basin. Some pheasants are present. Cottontails are also found in substantial numbers in the areas and flood plain pasture lands are favored by gray and fox squirrels. Ruffed grouse, gray squirrel, and woodcock are found throughout the forested areas. Some wild turkeys also inhabit the southern portion of the basin.

Present Recreation Opportunity Without the Project - Data from the Bureau of Sport Fisheries and Wildlife indicate that the eight-mile segment of the Genesee River to be inundated by the reservoir will support 12,800 man days of fishing annually and about 9,000 man days of fishing annually can be attributed to the 12-mile downstream fisheries. In addition, it is estimated that about 7,000 annual big game hunter-days and 6,000 small game hunter-days can be attributed to the area without the project. Waterfowl use is estimated at 1,500 hunter-days annually in the vicinity of the proposed Stannard Reservoir project. (See table 10-23 and Appendix G.)

Recreation Market Area - The Bureau of Outdoor Recreation defines the recreation market area as that area from which 90 percent of the visitors to a project will be drawn on one-day outings and weekend trips. The Bureau determined that approximately 50 percent of the expected participating population in the market area of Stannard Reservoir reside within a 50-mile radius.

The following formula, developed by Messrs. Duck, Beard, and Roth of the Ohio River Division, U.S. Army Corps of Engineers, and presented in Technical Paper No. 4, "A Simplified Method for Deriving Cost Estimates for Recreation Survey Scope Investigations," was used in determining the initial and ultimate daily attendance for general recreation:

$$DL = \frac{\dfrac{52.1\% \times A\ 71.0\%}{13}}{1.5}$$

Where:

DL = Design load = The number of people expected to use a project or facility at any one time on a normal summer Sunday.

71.0% = Percent of weekly attendance expected on a normal summer Sunday.

A = Estimated annual general recreation attendance, 155,000 initial and 233,000 ultimate.

57.6% = Percent of attendance that will visit project during recreation season.

13 = Number of weeks in recreation season.

1.5 = Turnover rate of use of facility.

Based on the following tabulation showing an assumed distribution of general recreation attendance among types of activities, and design criteria presented in Technical Paper No. 4, the amount and types of facilities required to support the design load were developed by the Buffalo District, Corps of Engineers.

Activity	Distribution of attendance among types of activities, percent of total annual attendance 1/
Boating	6.0
Picnicking	19.0
Camping	13.0
Swimming	25.0
Hiking	6.0
Sightseeing	31.0
	100.0

1/ Assume that all participants may also be involved in land-based fishing and thus may have more than one activity per visitor-day.

The Bureau of Sport Fisheries and Wildlife furnished recommendations on facilities required for fishing. These recommendations are discussed in Appendix G of this report. The locations of three downstream access sites for white-water canoeing and other outdoor activities are shown on exhibit 10-7.

Day use facilities at the reservoir would include picnic grounds, beaches, boating and fishing access, camping facilities, and parking areas. Downstream facilities would include access sites with boat docks and ramps, picnic facilities, and parking areas. Recreation development would also include access and service roads, paths, and hiking trails. As detailed

planning progresses, a prime consideration will be to gain the optimum in recreation development without appreciable detriment to the natural beauty of the area. Circulation roads within proposed recreation areas would be constructed as close to existing grade as possible to curtail excessive earthwork and consequential scarring. Proper erosion control methods would be utilized where necessary, to stabilize highway slopes as well as stripped areas in the dam and spillway area.

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SECTION IV - COST ESTIMATES

15. PROJECT COST

The total cost of construction of the Stannard development is estimated to be $36,900,000. Estimates of first costs for the dam and reservoir and associated downstream facilities include cost of initial construction, future recreation facilities, contingencies, engineering and design, and supervision and administration. Construction costs for the dam and reservoir were based on detailed layouts shown on exhibit 10-6 and design considerations discussed in Section III. The cost estimates are based on December 1967 price levels. Contingency allowances amount to 20 percent of the cost for land acquisition and damages, 15 percent for recreation features, and 30 percent for other major features. Table 10-11 summarizes the first costs for the multiple-purpose reservoir project. Detailed estimate of first costs is shown in table 10-13.

Total investment costs and annual financial charges were developed for the project based on the data presented in the cost estimate. Investment costs include construction costs plus interest on the initial increment. Interest during construction was determined using an interest rate of 3-1/4 percent and a construction period of four years. Average annual charges were computed on the gross investment using the current Federal interest rate of 3-1/4 percent and an amortization period of 100 years. Operation and maintenance charges include costs for major replacement where applicable. Financial annual costs are summarized in table 10-12. Detailed estimate of the annual costs is shown in table 10-14.

Details of the initial and future first costs of recreation facilities are presented in table 10-15. The operation and maintenance costs of the recreation facilities are presented in table 10-16, which also contains a detailed summary of annual charges and benefits for general recreation, canoeing, and fishing developments at the Stannard Reservoir.

TABLE 10-11
SUMMARY OF FIRST COSTS
STANNARD RESERVOIR PROJECT

Item	Costs ($1,000)	Costs with indirect costs distributed ($1,000)
Lands and damages 1/	$ 1,310	$ 1,310
Relocations	14,400	16,796
Dam and appurtenances	14,230	16,597
Dike	500	587
Recreation	1,840	2,210 2/
Engineering and design	3,170	
Supervision and administration	2,050	
Total Project Cost	$37,500	$37,500

1/ Includes estimated lands required for recreational development.

2/ Of this amount $1,760,000 is for initial facilities and $450,000 is for future facilities.

TABLE 10-12
SUMMARY OF FINANCIAL ANNUAL COSTS
STANNARD RESERVOIR PROJECT

Item	Financial annual costs ($1,000)
Interest on gross investment	$ 1,290
Amortization of gross investment	54
Maintenance and operation	127
Major replacements	19
Total	$ 1,490

TABLE 10-13
DETAILED ESTIMATE OF FIRST COSTS
STANNARD RESERVOIR PROJECT
(December 1967 prices)

Item	Unit	Quantity	Unit price	Amount
1. LANDS AND DAMAGES				
Surface acquisition				
Reservoir land plus minimum recreation land	Acre	2,990	$ 70	$ 209,300
Houses	Ea.	30	6,100	183,000
Churches	Ea.	2	13,500	27,000
Farm units	Ea.	32	4,000	128,000
General store	Ea.	2	6,000	12,000
Restaurant	Ea.	1	11,000	11,000
Misc. bldgs. including 2 cemeteries	L.S.	-	-	334,500
W.A. & G.R.R. R.O.W.	L.S.	-	-	112,000
Acquisition costs	Par.	132	600	79,200
Subtotal, surface lands and damages				$1,096,000
Contingencies				208,000
Total, surface acquisition				$1,304,000
Archeological				
Historical survey and salvage	L.S.[1]	-	-	6,000
Total, LANDS AND DAMAGES				$1,310,000
2. RELOCATIONS				
Highways				
Relocation of Route 19	L.S.	-	-	$3,600,000
Reconstruction of county roads 38 and 29	L.S.	-	-	1,130,000
Relocation and reconstruction of misc. county & town roads	L.S.	-	-	50,000
Subtotal				$4,780,000
Railroads				
Relocation of W.A. & G.R.R.	Mi.	8	700,000	5,600,000

1/ Funds to be provided and studies to be made by the National Park Service during advanced planning.

Table 10-13 (contd)

Item	Unit	Quantity	Unit price	Amount
Utilities				
Relocate H.P. Gas and Electric transmission lines	L.S.	-	-	688,000
Subtotal				$11,068,000
Contingencies				3,332,000
Total, RELOCATIONS				$14,400,000
3. DAM AND APPURTENANCES				
Cofferdam and care of water	L.S.	-	-	$ 425,000
Excavation, borrow	C.Y.	725,000	$0.55	398,750
Excavation, common	C.Y.	975,000	0.70	682,500
Excavation, stripping	C.Y.	108,000	0.90	97,200
Excavation, trench	C.Y.	27,000	1.25	33,750
Excavation, rock	C.Y.	175,000	6.00	1,050,000
Embankment, compacted	C.Y.	1,127,000	0.20	225,400
Rock fill	C.Y.	153,500	3.00	460,500
Filter material	C.Y.	26,000	1.50	39,000
5-foot blanket	C.Y.	135,000	0.20	27,000
Mass concrete-spillway weir, right training wall, non-overflow section	C.Y	187,800	21.00	3,943,800
Concrete-stilling basin	C.Y.	8,150	30.00	244,500
Concrete-gate piers	C.Y.	3,140	46.00	144,440
Concrete-left upper training wall	C.Y	2,240	42.00	94,080
Concrete facing	S.F.	17,500	14.00	245,000
Portland cement	Bbl.	211,000	5.00	1,055,000
Steel reinforcement	Lb.	1,065,000	0.14	149,100
Tainter gates with embedded metal and machinery	Ea.	4	155,000	620,000
Tainter gate machinery housing	L.S.	-	-	20,000
Slide gates and accessories	Ea.	5	80,000	400,000
Conduit lining	Ea.	5	7,500	37,500
Control structure	L.S.	-	-	35,000
Electrical work	L.S.	-	-	70,000
Service bridge	L.S.	-	-	57,000
Steel guard railing	L.F.	3,900	3.50	13,650
Misc. items	L.S.	-	-	275,000
Clearing reservoir	Acre	400	250	100,000
Subtotal				$10,943,170
Contingencies				3,286,830
Total, DAM AND APPURTENANCES				$14,230,000

Table 10-13 (contd)

Item	Unit	Quantity	Unit price	Amount
4. DIKE (on Marsh Creek)				
Excavation, borrow	C.Y.	320,000	$0.55	$ 176,000
Embankment, compacted	C.Y.	217,000	0.20	43,400
Excavation, stripping	C.Y.	21,500	0.90	19,350
Excavation, trench	C.Y.	23,000	1.25	28,750
Filter material	C.Y.	10,000	1.50	15,000
Rock fill	C.Y.	30,500	3.00	91,500
5-foot blanket	C.Y.	53,500	0.20	10,700
Subtotal				$ 384,700
Contingencies				115,300
Total, DIKE				$ 500,000
5. RECREATION				
Initial development				
Facilities cost	L.S.	-	-	$ 1,274,400
Contingencies				191,600
Total, initial development				$ 1,466,000
Future development				
Facilities cost	L.S.	-	-	$ 328,990
Contingencies				45,010
Total future development				$ 374,000
Total, RECREATION				$ 1,840,000
6. ENGINEERING AND DESIGN				
Initial development	L.S.	-	-	$ 3,124,600
Future increment	L.S.	-	-	45,400
Total, ENGINEERING AND DESIGN				$ 3,170,000
7. SUPERVISION AND ADMINISTRATION				
Initial development	L.S.	-	-	$ 2,019,700
Future increment	L.S.	-	-	30,300
. Total, SUPERVISION AND ADMINISTRATION				$ 2,050,000

TABLE 10-14
DETAILED ESTIMATE OF FINANCIAL ANNUAL COSTS
STANNARD RESERVOIR PROJECT

Item	Financial annual costs
Total investment	
(1) Recapitulation of project costs	
(a) Initial costs	$ 37,050,000
(b) Incremental costs	450,000
(2) Interest during construction (at 3 1/4%) (initial cost only)	2,390,000
(3) Total gross investment	39,890,000
Annual initial costs	
(1) Interest on gross investment (at 3 1/4%)	1,282,000
(2) Amortization	54,000
(3) Maintenance and operation	
(a) Dam and reservoir	50,000
(b) Recreation	68,000
(4) Major replacements	
(a) Recreation	16,000
(5) Total initial annual costs	1,470,000
Annual future incremental costs 1/	20,000
Total annual costs	$ 1,490,000

1/ See table 10-16 for derivation.

TABLE 10-15

DETAILED ESTIMATE OF GENERAL RECREATION, CANOEING,

AND FISH AND WILDLIFE RECREATION COSTS

STANNARD RESEVOIR PROJECT

Item	Unit	Unit Cost	Initial Quantity	Initial Amount $	Future Quantity	Future Amount $	Total Quantity	Total Amount $
FACILITIES - GENERAL RECREATION								
Picnic Units	Each	2,160	28	60,480	14	30,240	42	90,720
Shelter Units	Each	11,610	1	11,610	1	11,610	2	23,220
Swimming beach	SF	1.25	36,250	45,310	18,750	23,440	55,000	68,750
Parking-swimming	Space	350	180	63,000	90	31,500	270	94,500
Boating	Unit	36,000	2	72,000	1	36,000	3	108,000
Sanitation	Unit	9,500	9	85,500	5	47,500	14	133,000
Water supply	Unit	1,200	39	46,800	20	24,000	59	70,800
Camping	Unit	1,500	114	171,000	57	85,500	171	256,500
Parking-general	Space	280	268	75,040	140	39,200	408	114,240
Roads-paved	Mile	65,000	2	130,000	-	-	2	130,000
Roads-gravel	Mile	30,000	1	30,000	-	-	1	30,000
Trails	Mile	8,000	5	40,000	-	-	5	40,000
SUBTOTAL - Facilities				830,740		328,990		1,159,730
Contingencies				126,260		45,310		171,570
SUBTOTAL				957,000		374,300		1,331,300
Engineering and design and supervision and administration				191,000		75,700		266,700
TOTAL COST - GENERAL RECREATION FACILITIES				1,148,000		450,000		1,598,000
FACILITIES - CANOEING (1)								
Double ramps	Each	12,000	3	36,000			3	36,000
Boat docks	Each	5,000	3	15,000			3	15,000
Picnic units	Each	2,160	11	23,760			11	23,760
Sanitation	Unit	9,500	3	28,500			3	28,500
Water supply	Unit	1,200	14	16,800			14	16,800
Parking - general	Space	280	210	58,800			210	58,800
SUBTOTAL - Facilities				178,860				178,860
Contingencies				26,940				26,940
SUBTOTAL				205,800				205,800
Engineering and design and supervision and administration				41,200				41,200
TOTAL COST - CANOEING FACILITIES				247,000				247,000
FACILITIES - FISH AND WILDLIFE (2)								
At the resevoir site								
Ramp and parking area	Unit	8,000	5	40,000			5	40,000
Sanitation	Unit	9,500	5	47,500			5	47,500
Water supply	Unit	1,200	5	6,000			5	6,000
Pier	Each	15,000	5	75,000			5	75,000
Parking - fishing piers	Space	280	200	56,000			200	56,000
Establish fish population	Unit	6,700	1	6,700			1	6,700
SUBTOTAL				231,200				231,200
Downstream								
Parking - fishing	Space	280	120	33,600			120	33,600
Contingencies				39,700				39,700
SUBTOTAL				304,500				304,500
Engineering and design and supervision and administration				60,500				60,500
TOTAL COST - FISH AND WILDLIFE FACILITIES				365,000				365,000

(1) Based on providing three downstream access sites as shown on Exhibit 10-7.

(2) Based on information in Fish and Wildlife Service report dated 17 May 1968. (See Appendix G)

TABLE 10-16

DETAILED SUMMARY OF CONSTRUCTION AND INVESTMENT

COSTS, ANNUAL CHARGES, ANNUAL BENEFITS AND VISITORS

GENERAL RECREATION, CANOEING, AND FISH AND WILDLIFE RECREATION

Item	Initial Increment	Future Increment	Total	Future Increment Discounted	Total with Future Increment Discounted
CONSTRUCTION COSTS					
Facilities - general recreation	$1,148,000	$450,000	$1,598,000		
Real estate - all recreation	70,000		70,000		
First cost	1,218,000	450,000	1,668,000		
Canoeing facilities					
First cost	247,000		247,000		
Fishing facilities					
First cost	365,000		365,000		
Total construction costs	$1,830,000	$450,000	$2,280,000		
INVESTMENT COSTS					
General recreation	$1,218,000	$450,000	$1,668,000		
Interest during construction (4 yrs.)	80,000		80,000		
Canoeing	247,000		247,000		
Interest during construction (2 yrs.)	8,000		8,000		
Fishing	365,000		365,000		
Interest during construction (2 yrs.)	12,000		12,000		
Total investment costs	$1,930,000	$450,000	$2,380,000		
ANNUAL CHARGES					
General recreation					
Interest	$ 42,200			$ 8,000	$50,200
Amortization	1,800			300	2,100
Operation and maintenance (1)	32,000			8,500	40,500
Major replacement (2)	11,000			3,200	14,200
Subtotal	$ 87,000			$20,000	$107,000
Canoeing					
Interest	8,300				8,300
Amortization	400				400
Operation and maintenance (1)	21,200				21,200
Major replacement (2)	2,100				2,100
Subtotal	$ 32,000				$32,000
Fishing					
Interest	12,300				12,300
Amortization	500				500
Operation and maintenance (3)	15,000				15,000
Major replacement (2)	3,200				3,200
Subtotal	$ 31,000			$20,000	$31,000
Total annual financial charges	150,000			20,000	170,000
VISITATION (recreation-days)					
General recreation	155,000	78,000	233,000		
Canoeing	20,000		20,000		
Fishing	156,200		156,200		
Small access sites	85,000		85,000		
Total visitation	416,200	78,000	494,200		
BENEFITS					
General recreation	$ 155,000	$78,000	$$ 233,000		$ 195,500 (4)
Canoeing	80,000		80,000		64,200 (4)
Fishing	624,800		624,800		587,600 (4)
Small access sites	340,000		340,000		272,700 (4)
Total benefits	$1,199,800	$78,000	$1,277,800		$1,120,000

(1) Operation and maintenance- $0.20 per visitor day, future increment discounted by 0,5418.
(2) Major replacement- initial facility investment x 1/3 x 0.0252, future increment investment x 1/3 x 0.0133.
(3) Based on information in Fish and Wildlife Service report dated 17 May 1968.
(4) Benefits discounted by the effect of drawdown and rounded.

16. DEVELOPMENT COSTS

The comprehensive development plan includes investment in industrial, commercial, and residential development. A summary of the potential investment per acre by land use and investment category is shown in table 10-29. Induced investments, which include both public and private investments, were estimated at \$20,200,000. Of this, approximately \$12,550,000 would be for the construction of the proposed pulp and paper mill. After construction of the mill it was assumed that the remaining investments would occur over a fifty year period at a uniform rate. Federal investments were classified entirely as public with a useful life of 50 years. Non-Federal investments were broken down into residential, public, industrial and commercial.

Residential and public investments were assumed to have useful lives of 50 years. Industrial and commercial investments were assumed to consist of 50 percent equipment, with a 25-year useful life, the remainder having a 50-year life. Major replacements were phased in for both Federal and non-Federal investments in accordance with these assumptions for the 100-year project life.

All yearly investments were converted to present worth values at a 3-1/4 percent interest and amortization rate. The accumulated present worth of Federal and non-Federal investments were spread over the 100-year life of the project at 3-1/4 percent and 5 percent interest rates, respectively. Average annual charges for the development plan are \$1,180,000.

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SECTION V - BENEFITS

17. SUMMARY

The reservoir and area development plan would provide benefits, both to the nation and the project region, which have been classified into two categories; user and expansion benefits. Subsequent paragraphs of this section describe the procedures and techniques used to measure these benefits. A summary of total benefits is given in table 10-17.

TABLE 10-17
SUMMARY OF ANNUAL BENEFITS
STANNARD RESERVOIR PROJECT

Category and class of benefits	Annual Benefits				
	National account only	Regional account only	National & regional account	Total national account	Total regional account
	$	$	$	$	$
User benefits					
Flood control	-	-	30,000	30,000	30,000
Water quality control 1/	101,000	-	808,000	909,000	808,000
Water supply	-	-	30,000	30,000	30,000
Recreation	336,000	-	784,000	1,120,000	784,000
Irrigation	-	-	56,000	56,000	56,000
Total user benefits	437,000	-	1,708,000	2,145,000	1,708,000
Expansion benefits					
Redevelopment	-	292,600	56,400	56,400	349,000
Developmental	-	4,780,400	380,600	380,600	5,161,000
Loss of income 2/	-	-406,000	-54,000	-54,000	-460,000
Net expansion benefits	-	4,667,000	383,000	383,000	5,050,000
Total BENEFITS	437,000	4,667,000	2,091,000	2,528,000	6,758,000

1/ FWPCA has raised questions concerning the magnitude of flows required for quality control, associated storage requirements, and benefits to be credited to this purpose. Therefore, complete reappraisal of this aspect of the project will be made in connection with detailed engineering studies to follow.

2/ Annual loss of income from lands taken for project.

18. USER BENEFITS

The benefits directly resulting from the project functions of flood control, water quality control, water supply, recreation, and irrigation would include (a) flood damage reduction in Appalachia, (b) general recreation development including canoeing and fish and wildlife enhancement with attendance expected from other regions as well as locally, (c) low-flow augmentation for water quality improvement both in and outside Appalachia, and (d) a water supply for industrial use and irrigation within Appalachia.

Flood Control - As a minimum, 4,000 acre-feet of storage would be available in the reservoir at all times. The computer program used for routing flows in the Stannard Reservoir study allows a reservoir draw-down rule curve. This rule curve can be overridden if the maximum reservoir outflow is made small. If the maximum outflow was increased by 1,000 to 2,000 cfs, the following monthly pool elevations, or less, would have occurred 100 percent of the time in these months.

Month	Reservoir elevation	Available storage capacity (A-F)
January	1599	47,700
February	1593	58,300
March	1615	12,000
April	1620	4,000
May	1620	4,000
June	1620	4,000
July	1620	4,000
August	1620	4,000
September	1620	4,000
October	1620	4,000
November	1614	16,700
December	1606	33,200

The amount that various floods would be reduced by the above storages was determined by assuming that the hydrographs were triangular and based on the peak flow, the total time of the storm was assumed. From this, the volumes of the storm runoffs were computed. Assuming that the available reservoir storage would be used to reduce the peak flow, the new outflows for each storm for each month was determined. The resulting discharge - frequency relationships are shown in table 10-18.

TABLE 10-18
DISCHARGE - FREQUENCIES
STANNARD RESERVOIR

Frequency	Natural flow, cfs	Flow with reservoir in place by month, cfs January	February	March	April-October	November	December
0.005	20,000	6,600	5,300	13,000	16,000	12,000	9,000
0.01	18,000	5,000	3,900	11,000	14,300	10,400	7,500
0.02	16,000	3,900	2,200	10,000	13,000	9,000	6,000
0.05	13,000	1,900	600	7,500	10,000	6,400	3,900
0.10	11,000	250	0	6,000	8,000	4,500	2,000
0.20	9,000	0		4,500	6,000	3,100	900
0.30	7,500			3,100	5,000	2,200	0
0.40	6,600			2,200	4,200	1,500	
0.50	6,000			1,900	3,600	1,000	
0.60	5,000			1,300	2,600	400	
0.70	4,500			700	2,300	10	
0.80	3,900			250	1,900	0	
0.90	3,100			0	1,300		
0.95	2,600				800		
0.98	2,200				460		
0.99	1,900				200		
0.995	1,700				50		
0.998	1,500				0		
0.999	1,300				0		

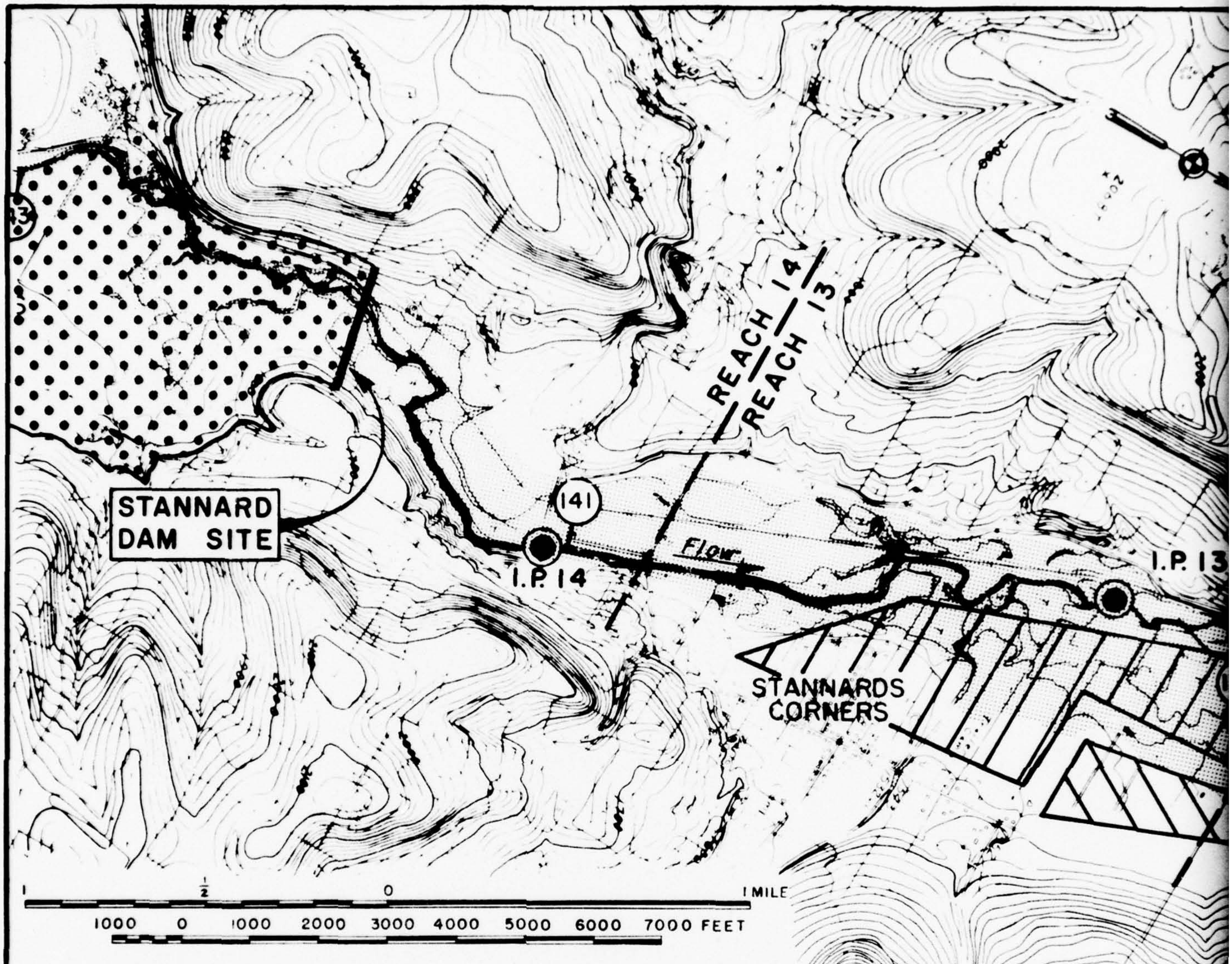
A combined damage-frequency curve was developed for reaches 10, 11, 12 and 13. These reaches are shown on exhibits 10-10 and 10-11. A combined damage-frequency curve for Dyke Creek for reaches 10, 11, and 12 was also developed. The results of these relationships are shown in tables 10-19 and 10-20, respectively.

TABLE 10-19
COMBINED DAMAGE-FREQUENCY RELATIONSHIPS FOR
REACHES 10, 11, 12 AND 13
STANNARD RESERVOIR

Frequency	Damage $
0.005	83,100
0.01	66,400
0.02	54,600
0.05	39,000
0.10	30,700
0.20	21,300
0.30	16,500
0.40	11,500
0.50	9,100
0.60	7,100
0.70	5,000
0.80	3,200
0.90	200
0.95	0

TABLE 10-20
COMBINED DAMAGE-FREQUENCY RELATIONSHIPS FOR DYKE CREEK
FOR REACHES 10, 11, 12
STANNARD RESERVOIR

Frequency	Damage $
0.005	13,700
0.01	9,200
0.02	7,100
0.05	5,300
0.10	2,500
0.20	200
0.30	0



LEGEND

SPILLWAY DESIGN FLOOD POOL ELEVATION 1625

FLOODED AREA 1950 FLOOD

U.S.G.S. RECORDING GAGE

I.P. 14 INDEX POINT REACH 14

(141) DISTANCE ABOVE THE MOUTH (LAKE ONTARIO) IN MILES

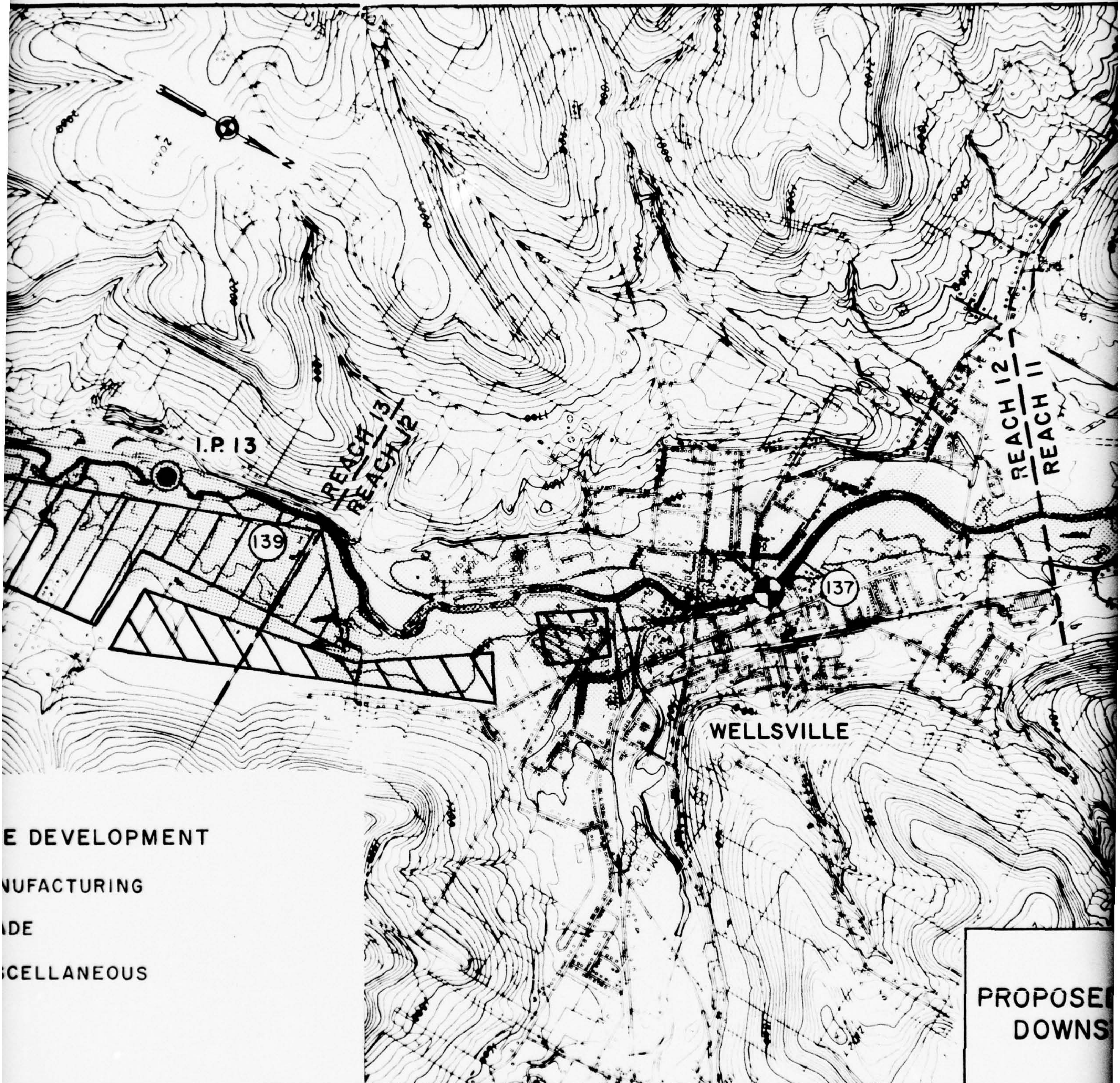
FUTURE DEVELOPMENT

MANUFACTURING

TRADE

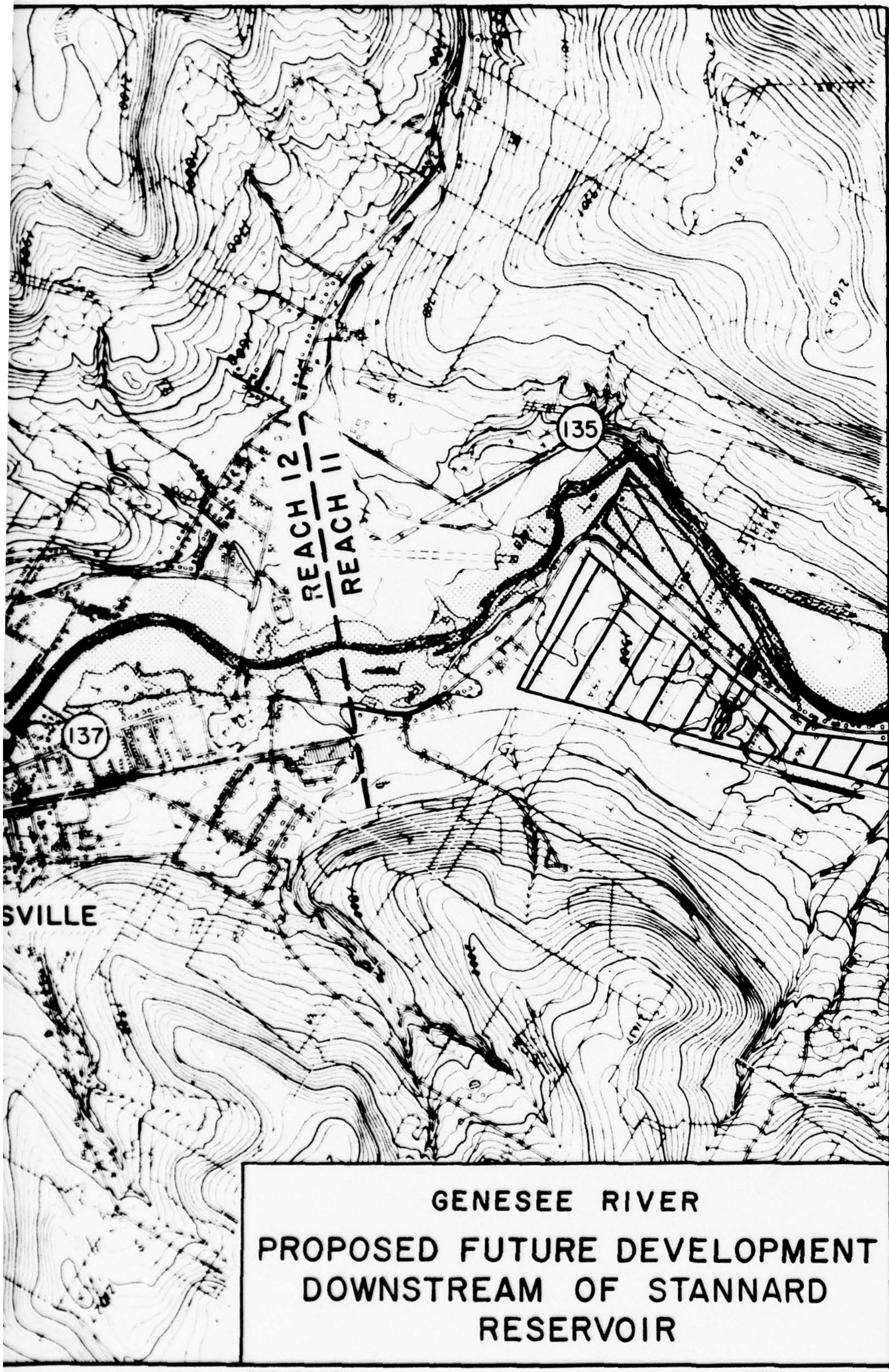
MISCELLANEOUS

2



I.P. 13
REACH 13
REACH 12
139
137
WELLSVILLE
REACH 12
REACH 11
E DEVELOPMENT
NUFACTURING
ADE
SCELLANEOUS
PROPOSED
DOWNS

3



GENESEE RIVER

PROPOSED FUTURE DEVELOPMENT DOWNSTREAM OF STANNARD RESERVOIR

EXHIBIT 10-10

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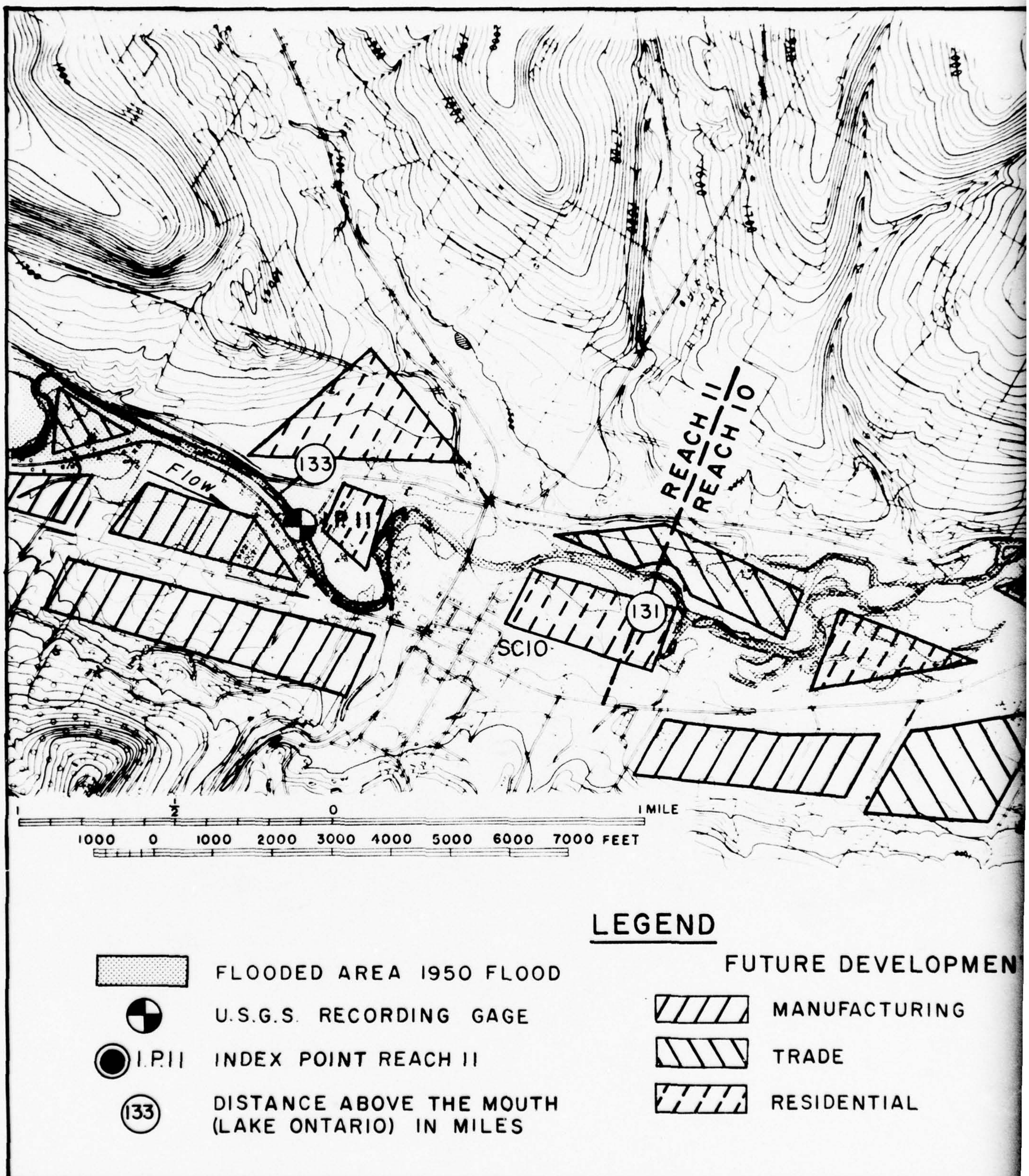

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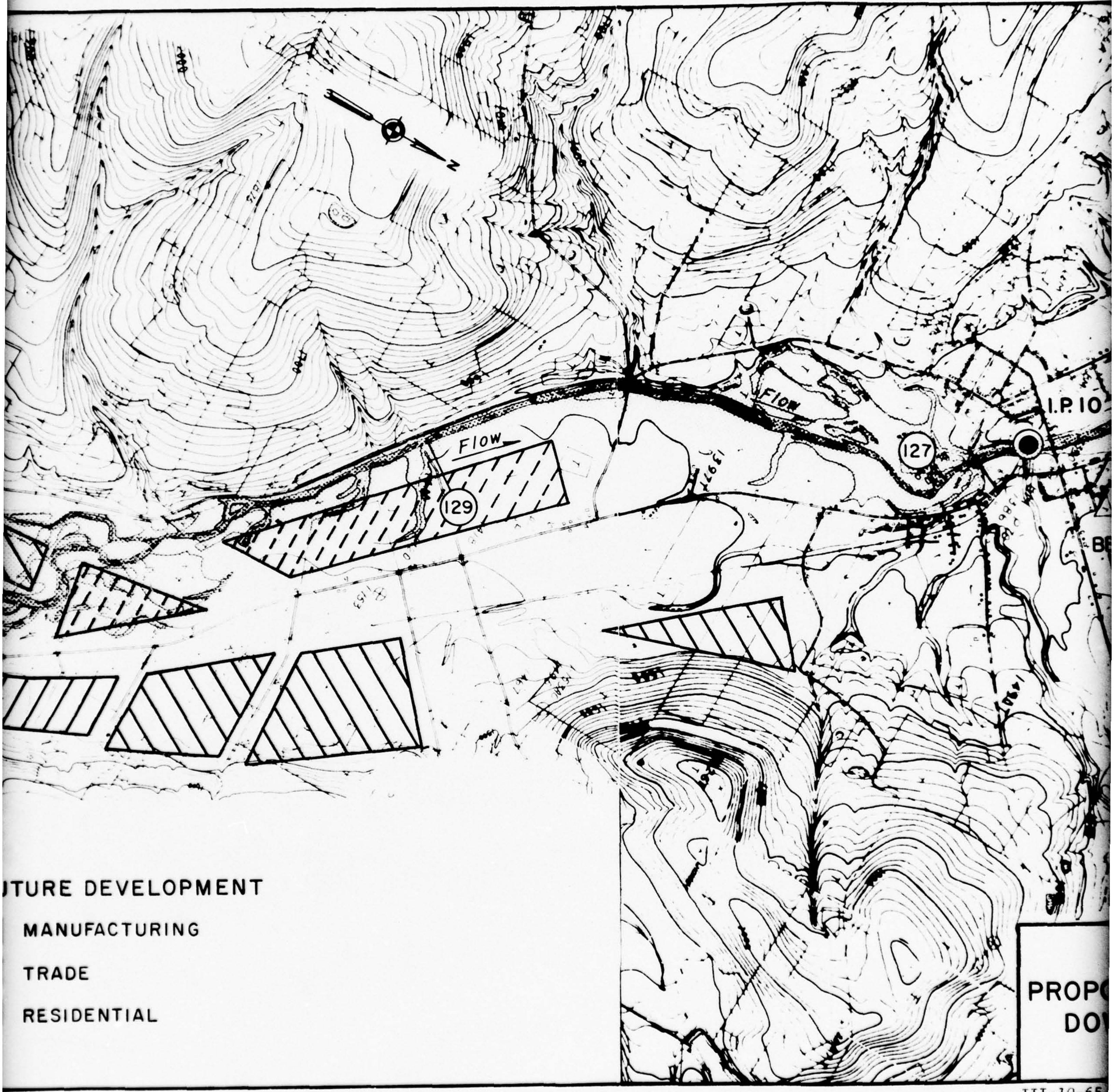

Flow
Flow
129
127
I.P. 10
UTURE DEVELOPMENT
MANUFACTURING
TRADE
RESIDENTIAL
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3

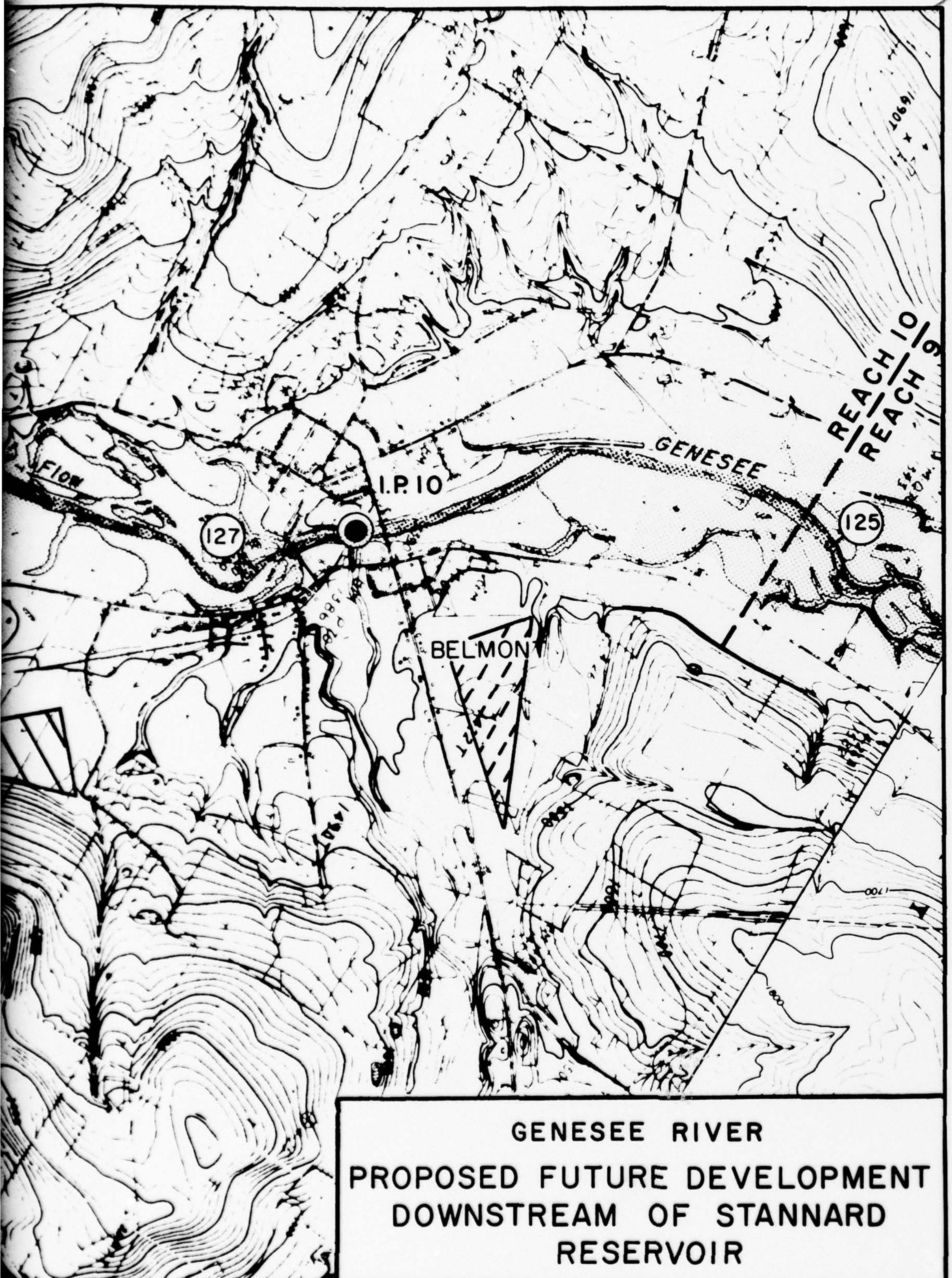

EXHIBIT 10-11

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The next step involved combining the discharge-frequency relationships under improved conditions with the damage-frequency relationships shown in tables 10-19 and 10-20 to form damage-frequency relationships for improved conditions. The selection of a residual damage figure was made as follows:

The natural frequency of the reservoir outflow under improved conditions was used to find the main stem damage. Next, the damage caused by a storm on Dyke Creek of the same frequency as the storm causing the inflow to the reservoir was checked. The largest of the two damages was selected as the residual damage for the improved outflow. As example of this is as follows:

In January a 200-year storm (0.005 frequency) would have the 20,000 cfs inflow reduced to 6,600 cfs. The flow of 6,600 cfs has a natural frequency of 0.40. The damage at this frequency as shown in table 10-19 is $11,500. However the damage caused by a 200-year storm from Dyke Creek would be $13,700. Thus, $13,700 would be the residual damage. The computations reflect the combination of frequency of any flood occurrence on both Dyke Creek and the main stem and it was assumed that the flows for both would not coincide.

Table 10-21 shows the damage-frequency figures by months for improved conditions.

Table 10-21

DAMAGE-FREQUENCY RELATIONSHIPS

STANNARD RESERVOIR

Frequency	Weight factor	Natural conditions $	Improved conditions January $	February $	March $	April-October $	November $	December $
0.005	0.015	83,100	13,700	13,700	39,000	54,600	35,000	21,300
0.01	0.015	66,400	9,200	9,200	30,700	46,500	25,800	16,500
0.02	0.04	54,600	7,100	7,100	25,500	39,000	21,300	7,100
0.05	0.08	39,000	5,300	5,300	16,500	25,500	11,000	5,300
0.10	0.15	30,700	2,500	2,500	9,100	18,000	5,000	2,500
0.20	0.20	21,300	200	200	5,000	9,100	200	200
0.30	0.20	16,500	0	0	200	7,100	0	0
0.40	0.20	11,500			0	4,100		
0.50	0.20	9,100				1,500		
0.60	0.20	7,100				0		
0.70	0.20	5,000						
0.80	0.20	3,200						
0.90	0.15	200						
0.95	0.08	0						
0.98	0.04	0						
0.99	0.015	0						
0.995	0.008	0						
0.998	0.004	0						
0.999	0.003	0						
Annual monthly damages		13,500	750	750	2,900	6,100	1,700	850
Monthly benefits			12,750	12,750	10,600	7,400	11,800	12,650

To find the average annual benefits from flood control under the rule curve operation, the monthly benefits were multiplied by weighted factors. These factors are based on the assumption that between 1 May and 31 July there is a 21 percent chance that damaging floods will occur and a 79 percent chance during the remainder of the year. The weighted factors are 0.0700 for the months of May, June, and July and 0.0878 for the remaining months. The average annual benefits for existing development would be:

Month	Benefit $	Factor	Weighted benefit $
January	12,750	0.0878	1,120
February	12,750	0.0878	1,120
March	10,600	0.0878	930
April	7,400	0.0878	650
May	7,400	0.0700	520
June	7,400	0.0700	520
July	7,400	0.0700	520
August	7,400	0.0878	650
September	7,400	0.0878	650
October	7,400	0.0878	650
November	11,800	0.0878	1,040
December	12,650	0.0878	1,110
Total		1.0000	9,500

Future development was based on the land requirements to support the projections made for Allegany County under the Appalachian study. Approximately 3,400 acres are required in Allegany County to support the developmental benchmark projections. Of this, approximately 1,800 acres of land downstream from the Stannard Reservoir site to Belmont could be developed by year 2020. Approximately 640 acres of these 1,800 acres would be subject to flood damage from the 100-year occurrence without the reservoir. The 169 acres required for the pulp mill and accompanying investments could be wholly on flood-free land. Future development of the sites was based on a residential, commercial, and industrial breakdown. Commercial development was considered as being businesses such as retail establishments in plazas, while industrial development was considered as manufacturing. Average annual damages were considered on a per acre basis. Damage values for residential units were based on a recent damage estimate made for the Scio area. This value was $830 per acre. Average annual damage values per unit for both industrial and commercial units were taken from tables in "Flood Insurance Study" prepared by the Corps of Engineers for the Department of Housing and Urban Development. In the case of industry, the unit damage was taken to be $5,400 and assuming an average of five acres per unit, the damage per acre was $1,080. For commercial damage the unit value was taken to be $900. One unit per acre including

parking area was assumed, giving a damage per acre of $900. Table 10-22 shows the acreages, site characteristics, and average annual damages to future development. The location of the considered future development is shown on exhibits 10-10 and 10-11.

TABLE 10-22
ESTIMATED FUTURE DEVELOPMENT AND DAMAGES
STANNARD RESERVOIR

Type of development	Estimated acres	Estimated average annual damages	
		Per flooded acre	Total
		$	$
Manufacturing	260	1,080	280,000
Commercial trade	235	900	212,000
Residential	125	830	104,000
Public	20	500	10,000
Total	640		606,000

Of the $606,000 worth of estimated average annual damages to future development, $285,000 would accrue to 275 acres above Dyke Creek. The remaining $321,000 worth of damages would be to 365 acres of future development along the Genesee River below Dyke Creek. Using a project life of 100 years and a normal growth curve for a 50-year period for future development, the equivalent average annual damages would amount to $282,000. Assuming that the Stannard Reservoir project would eliminate the same proportion of future damages as existing, the total average annual benefits for flood control are $9,500 plus $198,500, or $208,000. Based on the growth projected by historical trends, damages to future development were determined to be three times the damages to existing development or $40,500 annually. Average annual benefits for flood protection from these damages would amount to $30,000. The remaining benefits, $208,000 less $30,000, or $178,000 were considered to be developmental expansion benefits for the induced investments but were not included as it was considered double counting.

Recreation Benefits - An analysis of the recreation potential of the proposed Stannard Reservoir project has been made. A detailed breakdown of facilities and recreation opportunities to be provided at the project is presented in tables 10-15 and 16 of Section IV. Benefits attributed to general recreation are summarized as follows. Initial general recreation attendance at Stannard is estimated at 155,000 annually. The ultimate attendance is estimated to be 233,000 annually. The month of August was selected as the critical month for determining at-site recreation benefits based on the frequency of the five-foot drawdown. Full benefits were attributed to pools with a five-foot drawdown or less. Benefits were reduced 20 percent for the percent of time during the month of August for the period of record that the drawdown would be greater than five feet. Average annual benefits for at-site general recreation are estimated at $195,500, based on a general recreation-day value of $1.00.

The net increase, with the project, in downstream benefits for canoeing and the small access sites were evaluated on the basis of the percent of time that downstream flows were 190 cfs and greater during the summer months of June, July, and August for the period of record. This analysis includes the effects of the increased flows due to providing 1,000 cfs for two 12-hour days or four 12-hour days as shown in table 10-5. Full benefits, for both canoeing and the access sites, were claimed for flows of 190 cfs and greater. For flows less than 190 cfs, down to a minimum maintained flow, factors were derived for each month by prorating the flow to 190 cfs and multiplying by the percent of the time for this flow occurrence. The minimum maintained flows for the selected plan would be 90 cfs in the month of June and 120 cfs in the months of July and August. The average of the three monthly factors was used in reducing the optimum annual benefits for canoeing and the small access sites. Average annual canoeing and access benefits are estimated at $64,200 and $272,700, respectively, based on a recreation-day value of $4.00 for these activities.

Fish and Wildlife - The estimated value of the existing fishery and that provided by the ultimate development of the reservoir project is given in table 10-23. In deriving the net increase in benefits for project conditions, the coldwater (trout) fishing was assigned a recreational value of $4.00 per fisherman-day at all sites.

TABLE 10-23
AVERAGE ANNUAL FISHERY VALUES

Location	Without project (man-days)	With project (man-days) 1/	Net increase Man-days	Net increase Value
Genesee River (8 mi. of stream inundated by reservoir)	12,800	150,000	137,200	$548,800
Fishing piers	0	10,000	10,000	40,000
Genesee River (12 mi. of stream below reservoir)	9,000	18,000	9,000	36,000
Total	21,800	178,000	156,200	$624,800 2/

1/ In no event should the minimum release be less than 50 cfs.

2/ Rounded.

The drawdown for the fifty percent frequency of occurrence in the month of October for the period of record was selected as the governing month for analyzing fishing benefits. The total net benefits downstream

were included for all the plans studied. The reservoir fishing benefits were reduced directly in proportion to the loss in surface area for each drawdown. Average annual fishing benefits are estimated at $770,600.

The hunting opportunities under existing conditions would be substantially replaced by those provided at suitable locations on the lands acquired at the site that are not required for project operation, safety, or intensive recreational development. The wildlife values are considered to be equivalent for pre-project and project conditions.

<u>Water Quality Control</u> - Benefits for meeting the water quality requirements for the Genesee River reach below the Gates-Chili-Ogden treatment plant were taken as equivalent to the least costly alternative means of achieving the dissolved oxygen requirement. As determined under the Genesee River Basin study, annual costs for advanced treatment would be $101,000 at Gates-Chili-Ogden. For the Federal Water Pollution Control Administration criterion of meeting target flows 95 percent of the time, single-purpose storage required for flow augmentation would total 15,000 acre-feet including sediment storage, evaporation and other losses. Least costly storage of this capacity would be obtained from a combination of upstream reservoir sites studied by the Soil Conservation Service on Ford Brook, a tributary of the Genesee River, in the vicinity of Stannard, New York and on South Branch, a tributary of Van Campen Creek, in the vicinity of Nile, New York. These reservoir sites are referred to as sites 3-3 and 6-5, respectively, in the Genesee River Basin report with costs as follows:

First cost	$3,480,000
Investment (1-year construction period)	3,480,000
Annual charges:	
Interest and amortization (3-1/4 percent, 100-year life)	118,000
Operation and maintenance	5,000
Total annual charges	$ 123,000

Water quality improvements were thus assumed to be $101,000 annually for this reach, which is located north of the Appalachian Region.

Of the 95 cfs daily flow required by the proposed pulp mill, 80 cfs was considered to be required for maintenance of stream quality.*/ Costs for providing this flow of 80 cfs were taken as the costs of providing

*/ FWPCA has raised questions concerning the magnitude of flows required for quality control, associated storage requirements, and benefits to be credited to this purpose. Therefore, a complete reappraisal of this aspect of the project will be made in connection with detailed engineering studies to follow.

37,500 acre-feet of active storage in an alternative single-purpose reservoir at the Stannard Site. Costs for this scaled down reservoir at the Stannard site are as follows:

First cost	$21,000,000
Investment (4-year construction period)	22,365,000
Annual charges:	
Interest and amortization (3-1/4 percent, 100-year life)	758,000
Operation and maintenance	50,000
Total annual charges	$ 808,000

Flows required by the proposed mill would not be adequate to meet the total water quality requirements below the Gates-Chili-Ogden treatment plant. Downstream flows from plan C1 would have been deficient eight times during the 58 years of record. Single-purpose storage required for supplemental flow augmentation would total 4,600 acre-feet including evaporation losses. Least costly storage of this capacity would be obtained from upstream reservoir site 3-3, studied by the Soil Conservation Service, with annual charges of $31,000. By including adequate flows in the multiple-purpose project to meet the water quality requirements below the Gates-Chili-Ogden treatment plant (plan E1), the net loss to upstream benefits would be approximately $1,400 annually. Therefore, additional releases, as required, would be made from the proposed multiple-purpose project to meet the total water quality requirements for this reach. Total water quality control benefits were thus assumed to be $909,000 annually.

Water Supply - Of the 95 cfs daily flow required by the proposed pulp mill, 15 cfs was considered as water supply of which 5 cfs would be consumptive. Costs for providing this flow of 15 cfs were taken as the costs of providing 4,300 acre-feet of active storage in a single-purpose reservoir. Least costly storage of this capacity would be obtained from upstream reservoir site 3-3, scaled down with costs as follows:

First cost	$830,000
Investment (1-year construction period)	830,000
Annual charges:	
Interest and amortization (3-1/4 percent, 100-year life)	28,200
Operation and maintenance	1,800
Total annual charges	$ 30,000

Irrigation - Benefits from water supply for supplemental irrigation were based on increase in annual yield, net of on-farm costs, from lands expected to be irrigated. A net benefit of approximately $16.00 per acre for these lands was determined by the Soil Conservation Service. The benefits were discounted for a period of 15 years to reflect the time lag between availability and use of reservoir storage for this purpose. Alternative costs for irrigation were taken as the costs of providing 6,300 acre-feet of active storage in a single-purpose reservoir. Least costly storage of this capacity would be obtained from upstream reservoir site 3-3, scaled down with costs as follows:

First cost	$1,216,000
Investment (1-year construction period)	1,216,000
Annual charges:	
Interest and amortization (3-1/4 percent, 100-year life)	41,200
Operation and maintenance	1,800
Total annual charges	$43,000

User benefits of the Stannard Reservoir project are summarized in table 10-24.

TABLE 10-24
SUMMARY OF USER BENEFITS
($1,000)

Item of Benefit	Annual Benefit $
Flood Control	
Present	9.5
Future	20.5 1/
Recreation	
General	195.5
Fish and wildlife	587.6
Canoeing	64.2
Small access sites	272.7
Water Quality Control 2/	909.0
Water Supply	30.0
Irrigation	56.0
TOTAL BENEFITS	2,145.0

1/ Discounted to present worth and amortized at 3-1/4 percent.
2/ FWPCA has raised questions concerning the magnitude of flows required for quality control, associated storage requirements, and benefits to be credited to this purpose. Therefore, a complete reappraisal of this aspect of the project will be made in connection with detailed engineering studies to follow.

In addition to the above benefits, there might also be downstream power benefits to existing hydroelectric plants on the Genesee River located below Mt. Morris Dam. These benefits would depend upon the operation of the plants and were not evaluated for this study.

19. EXPANSION BENEFITS

Expansion benefits are presented in two components. One, described as redevelopment benefits, is measured in terms of the wage and salary components of expenditures for construction and operation and maintenance of the project. The second component of expansion benefits, identified as developmental benefits, are measured in terms of regional and national efficiency gains resulting from recreation expenditures and induced investments.

Redevelopment Expansion Benefits - Redevelopment expansion benefits credited to the regional account consist of the average annual equivalent of all labor costs used in construction, operation and maintenance of the water resource plan. Benefits credited to the national account are the wage payments made to persons who would otherwise be unemployed or underemployed in the absence of the project and who possess the necessary skills required for the project construction.

Labor costs for project construction were assumed to be 25 percent of contractor's earnings plus contingencies. Further analysis was made to determine the degrees of skill required in project construction and what portion of these labor skills could be furnished from the locally unemployed or underemployed. The results of these studies are presented in table 10-25.

TABLE 10-25
LABOR SKILL REQUIRED FOR CONSTRUCTION,
OPERATION AND MAINTENANCE OF PROJECT

Item	Labor required (percent)	Supplied locally (percent)	Redevelopment factor National account	Redevelopment factor Regional account
Construction				
Skilled	56	25	0.14	0.56
Semi-skilled	17	40	0.07	0.17
Unskilled	27	90	0.24	0.27
TOTAL	100		0.45	1.00
Operation and maintenance 1/				
Skilled	40	0	0	0.40
Semi-skilled	30	0	0	0.30
Unskilled	30	0	0	0.30
TOTAL	100		0	1.00

1/ For operation and maintenance of dam and reservoir only. For recreation and fish and wildlife features it was assumed that 45 percent of labor costs for O & M would be to local hires and 40 percent of these wages would be to the unemployed or underemployed.

Table 10-26 presents a summary of redevelopment expansion benefits credited to the regional and national accounts.

TABLE 10-26
SUMMARY OF REDEVELOPMENT EXPANSION BENEFITS
STANNARD RESERVOIR

Item	Expenditure	Labor costs 1/	Annual redevelopment benefits: National account 2/	Annual redevelopment benefits: Regional account 3/
	$	$	$	$
Construction				
Initial	30,579,300	7,644,825	46,700	259,000
Deferred	378,300	94,575	300	1,700
Subtotal	30,957,600	7,739,400	47,000	260,700
Annual operation and maintenance	125,500	88,300	9,400	88,300
TOTAL BENEFITS			56,400	349,000

1/ Labor costs are estimated to be 25 percent of contractor's earnings plus contingencies, 70 percent of operation and maintenance expenditures.
2/ Using a 3-1/4 percent interest rate and the appropriate redevelopment factor, future benefits were discounted to reflect an accelerated growth curve for future expenditures.
3/ Discounted where applicable by a 3-1/4 percent interest rate and accelerated growth curve for future expenditures.

Developmental Expansion Benefits - Developmental expansion benefits included in this report are measured in terms of wages and salaries stemming from induced investments and expenditures made by recreationists and return on industrial and commercial investments. The national account reflects the wages and salaries paid to people who would otherwise be unemployed or underemployed. The regional account includes all wages and salaries accruing within the region as a result of the water resource project and accompanying development.

The construction of the Stannard Dam and Reservoir project would make practicable the erection and operation of a competitive, moderately scaled pulp and paper mill. The area between Wellsville and Belmont is the prime location in the westerly portion of the Appalachian Region of New York State for a pulp and paper mill or particle board plant because of the availability of a labor force and adequate rail services and highways in the area. Present timber stands in private woodlots and State forests within an economic procurement radius of 40 miles of each of the many sites available between Belmont and the Stannard Reservoir site can

supply the annual wood requirements of a 100- to 125-ton per day capacity sulphate pulp and paper mill for a minimum of 20 years. Forest management would be expected to increase the annual supply indefinitely beyond the 20 years. Daily water requirements for the size of pulp and paper mill considered in this analysis would be 95 cfs daily, assuming the equivalent of good secondary treatment. Of this amount, 80 cfs was considered to be for water quality management and 15 cfs for process water. Of the 15 cfs process water, 5 cfs was considered to be consumptive. The provision of flow regulation in the Stannard Reservoir project, whether it be considered as low flow augmentation for water quality control or industrial water supply, will create a better climate in the Wellsville area for attracting industry. It was assumed that the pulp and paper industry would treat its wastes and disperse its effluents in a suitable manner, compatible to the other purposes of the project. Other water using industries will find the area attractive.

An integrated sulphate mill of the size considered in this study would be staffed by approximately 240 employees of whom approximately 75 percent would be production workers. To provide wood, labor requirements of up to 75 woodsmen and truckers can be procured within the commuting range of the plant. Various studies have indicated that each new manufacturing job in an area generates close to three-quarters of a job on the average in other service fields of employment; such as housing, transportation, trade, and finance, required to sustain a balanced area economy. It is estimated that 180 additional jobs would be created in the service fields after the plant becomes operational. A distribution of total employment by locally hired and imported categories is shown in table 10-27.

TABLE 10-27
DISTRIBUTION OF TOTAL EMPLOYMENT BY LOCALLY HIRED AND IMPORTED CATEGORIES

Employment types and skill levels	Employment locally hired: Number	Employment locally hired: Percent of total	Employment imported: Number	Employment imported: Percent of total
Manufacturing				
Management	0	0.0	25	100.0
Skilled	87	89.0	11	11.0
Semi-skilled	60	100.0	0	0.0
Unskilled	57	100.0	0	0.0
TOTAL	204	89.0	36	11.0
Field				
Skilled	10	100.0	0	0.0
Semi-skilled	50	100.0	0	0.0
Unskilled	15	100.0	0	0.0
TOTAL	75	100.0	0	0.0
Service				
Management	16	89.0	2	11.0
Skilled	40	89.0	5	11.0
Semi-skilled	72	100.0	0	0.0
Unskilled	45	100.0	0	0.0
TOTAL	173	96.0	7	4.0
TOTAL EMPLOYMENT	452	92.0	43	8.0

Based on information for a similar operation at another location and using current hourly rates for various labor classifications in Allegany County, an annual payroll was developed for the persons to be employed. The cumulative national-regional employment wage benefits are shown in table 10-28.

TABLE 10-28

CUMULATIVE NATIONAL-REGIONAL EMPLOYMENT WAGE BENEFITS

Type of employment by skill level	Number of employees	Yearly wages in year 1967 Per employee $	Yearly wages in year 1967 Total wages $	Percent of wages to unemployed	Wages to national account $
Imported employment					
Manufacturing management	25	13,000	325,000	0	0
Manufacturing skilled	11	6,500	71,500	0	0
Service management	2	10,400	20,800	0	0
Service skilled	5	5,600	28,000	0	0
TOTAL	43	10,356	445,300		0
Locally hired employment					
Manufacturing skilled	87	6,500	565,500	0	0
Manufacturing semi-skilled	60	5,200	312,000	0.40	124,800
Manufacturing unskilled	57	4,700	267,900	1.00	267,900
Field skilled	10	6,500	65,000	0	0
Field semi-skilled	50	5,200	260,000	0.40	104,000
Field unskilled	15	4,700	70,500	1.00	70,500
Service management	16	10,400	166,400	0	0
Service skilled	40	5,600	224,000	0	0
Service semi-skilled	72	3,900	280,800	0.40	112,320
Service unskilled	45	3,600	162,000	1.00	162,000
TOTAL	452	5,252	2,374,100		841,520
TOTAL IMPORTED AND LOCALLY HIRED	495	5,[illegible]96	2,819,400		841,520

It is assumed that the mill would be constructed by the time that the construction of the dam and reservoir project is completed and the investments for the service component would take place at a uniform rate, over 50 years. The wage scale for the people employed by the induced investments was adjusted to increase at a historical compound rate of two percent per year over the 100-year life of the water resource project. The average annual developmental benefits from wages and salaries resulting from the induced investments are $399,500 for the national account and $4,606,400 for the regional account. Some of the spin-off effects of the additional money in the area has been accounted for in the expansion benefits from recreation, however, any double counting of expansion benefits is not considered significant.

It is assumed that all of the induced investments considered will take place in Allegany County. Based on projections resulting from the Appalachian developmental benchmarks as developed by the Office of Appalachian Studies, approximately 3,400 acres are required in Allegany County to accommodate the population growth by year 2020. This growth represents approximately 7,200 households, over and above the growth as indicated by historical trends. The 495 new jobs provided by the mill and accompanying investments would represent work for approximately 400 households. Of these, it was assumed that 350 would be new households. Thus, the mill and accompanying investments' share of the future job requirements in Allegany County is approximately five percent.

Based on information furnished by the Office of Appalachian Studies, a breakdown of the 3,400 acres into the land required for each land-use investment category was made. Five percent of these values were taken as the share creditable to the considered induced investments. Based on an average dollar investment per acre for each land-use category, as developed by the Office of Appalachian Studies, the total investment requirements were determined. Table 10-29 shows a breakdown of the land acres, average investment per acre, and total investment for each land-use investment category.

TABLE 10-29
POTENTIAL INVESTMENT PER ACRE BY LAND USE AND
INVESTMENT CATEGORY FOR THE WELLSVILLE AREA

Investment categories	Average investment per acre (in 1967 $)	Land acres by type of land use	Investment by type of land use (in 1967 $)
Private			
Industrial	169,622.84	74	12,552,090
Commercial	147,541.00	22	3,245,902
Residential	54,761.40	56	3,066,638
TOTAL	124,109.40	152	18,864,630
Public			
Federal	44,877.06	9	692,860
State and local	32,167.71	8	616,900
TOTAL	77,044.78	17	1,309,760
PUBLIC AND PRIVATE TOTALS	119,375.00	169	20,200,000 1/

1/ Rounded.

Developmental expansion benefits attributable to recreationists are measured in terms of the expansion effects of expenditures by recreational visitors. The following tabulation shows the average local expenditures per visitor, conservatively derived from numerous studies and reports.

One-way distance of travel	Daily expenditure per visitor
	$
0 - 25 mi.	0.50
26 - 50 mi.	1.00
51 - 75 mi.	2.00
More than 76 mi.	4.00

Applying Bureau of Outdoor Recreation's estimate of distance of residence of visitors, taken from a preliminary estimate made by the Bureau of Outdoor Recreation, results in an average expenditure of $1.60 per visitor. Distance of residence of visitors for fishing was based on a survey made on the upper Genesee River during the 1964 trout fishing season. The approximate distances traveled by fishermen utilizing the basin's streams were determined by recording the car license plates and later identifying the county or city of origin. Based on these determinations, the average expenditure per fisherman-day is $1.75.

On the basis of information furnished by the Office of Appalachian Studies, Cincinnati, Ohio, approximately 38 percent of visitor expenditures accrue as wages and salaries to individuals and 45 percent of wage flows for service industries would flow to those who would otherwise be unemployed or underemployed. The appropriate county income multiplier as contained in the study entitled, "Recreation as an Industry", prepared by Robert R. Nathan Associates, Inc., December 1966, was applied to the estimated recreation expenditures. Assuming a pattern of visitation growth approximating curve 1 of table 1, attached to Ohio River Division letter of 16 February 1966, the regional and national development expansion benefits from recreation expenditures are estimated at $554,600 and $41,100, respectively. Table 10-30 shows a summary of the estimated average annual developmental benefits creditable to the national and regional accounts.

TABLE 10-30
SUMMARY OF DEVELOPMENTAL EXPANSION BENEFITS
STANNARD RESERVOIR

Item	Recreation days	Average expenditure	Wages	Annual developmental benefits: National account 2/	Annual developmental benefits: Regional account
		$	$	$	$
General recreation	233,000	1.60	140,500 1/	18,900	254,900
Canoeing	20,000	1.60	12,100 1/	1,600	21,900
Small access sites	85,000	1.60	51,300 1/	6,900	93,000
Fish and wildlife	156,200	1.75	101,900 1/	13,700	184,800
Induced investments	-	-	2,819,400	339,500	4,606,400
TOTAL BENEFITS				380,600	5,161,000

1/ Percent of wages of total receipts - 0.377.
2/ Benefits were discounted to reflect a 20-year time horizon.

To arrive at net developmental benefits, an adjustment was made to reflect incomes which could reasonably be expected from the projected use, in the absence of the project, of lands which will be taken for the water resource project. No significant change in land use is foreseen in the absence of the project. National income losses were accounted for by an adjustment for loss in land productivity. Regional income losses were based on an estimate of personal incomes generated by current and future land use without the water resource project. The values generated, including the multiplier effects, for the national and regional annual income losses are estimated as $54,000 and $460,000, respectively. These values are shown under the expansion benefits in table 10-17 as a loss of income.

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SECTION VI - ECONOMIC ANALYSIS

20. INDEXES OF PERFORMANCE

One index of performance can be evaluated by reliance on the conventional ratio of benefits to costs generally developed for water resource projects. The numerator contains annual user benefits plus employment benefits attributable to direct construction and operation of the water resource project, less national loss of income from lands taken for the project. The denominator is the annual economic cost of the water resource project. Such an index, computed below, expresses the minimum index of performance in regard to national income augmentation.

$$\text{Total water resource plan} \quad \frac{\$2,147,400}{\$1,490,000} = 1.44$$

Another index of performance gives a relative measure of the contribution that the Stannard development would make to the objective of employment expansion. The numerator consists of increased regional wage payments for construction and operation of the water resource project less regional annual loss of income from lands taken for the project plus wages and salaries and other income flows to the region generated by the associated induced investments. The denominator is the annual cost, both public and private, necessary to provide the expansion in employment opportunities.

$$\begin{array}{r} \text{Total water resource plan} \\ \text{plus induced investments} \end{array} \quad \frac{\$5,050,000}{\$2,670,000} = 1.89$$

21. ALLOCATION OF COSTS

Costs of the Stannard Reservoir project were allocated by the separable costs-remaining benefits method. The separable cost of each user purpose was allocated to that purpose and the joint costs allocated to the user purposes plus regional income expansion. A description of the projects used to estimate separable costs and alternative costs is given in table 10-31. A summary of costs for these projects is given in table 10-32. Cost allocation by the separable costs-remaining benefits method for the Stannard Reservoir project is presented in table 10-33.

TABLE 10-31
DESCRIPTION OF PROJECTS USED FOR ESTIMATE
SEPARABLE AND ALTERNATIVE COSTS

Basis for separable cost	Basis of alternative cost
Flood Control	
Reservoir at the Stannard site with maximum conservation pool elevation 1620 and top of gates at elevation 1622. Optimum recreational development.	Local protection project for approximately 15 miles. First costs based on cost of the existing Wellsville project plus the estimated cost of the modification.
Water Quality Control	
Reservoir at the Stannard site with maximum conservation pool elevation 1620 and top of gates at elevation 1622. Optimum recreational development.	Combination of a single-purpose reservoir at the Stannard site with 37,500 acre-feet of active storage plus a single-purpose reservoir at upstream reservoir site 3-3 with 4,600 acre-feet of active storage.
Water Supply	
Reservoir at the Stannard site with maximum conservation pool elevation 1620 and top of gates at elevation 1622. Optimum recreational development.	Single-purpose reservoir at upstream reservoir site 3-3 with 4,300 acre-feet of active storage.
Irrigation	
Reservoir at the Stannard site with maximum conservation pool elevation 1620 and top of gates at elevation 1622. Optimum recreational development.	Single-purpose reservoir at upstream reservoir site 3-3 with 6,300 acre-feet of active storage.
Recreation	
Reservoir at the Stannard site with maximum conservation pool elevation 1601 plus 4,000 acre-feet of flood control storage. No recreational land or facilities.	Single-purpose reservoir at the Stannard site.
Regional Expansion	
The recommended multiple-purpose development at the Stannard site without the developmental plan.	The recommended multiple-purpose project at the Stannard site with the developmental plan.

TABLE 10-32

COST ALLOCATION STUDIES

(Summary of Costs, $1,000)

	Multiple - purpose reservoir								Alternative					Multiple - purpose project less					
	Specific-use lands & facilities								single-purpose projects										
	Recr.	W.Q. (1)	W.S.	Irr.	F.C.	Joint-use lands and facilities	Regional income expansion	Total costs	Recr. (2)	W.Q. (3)	W.S. (4)	Irr. (4)	F.C. (5)	Recr.	W.Q.	W.S.	Irr.	F.C.	Regional income Expansion
CONSTRUCTION FIRST COSTS																			
Water Resource Project														(6)					
Lands and damages	70	-	-	-	-	1,240	-	1,310	1,310					26,100	1,170	1,170	1,170	1,170	1,318
Dam and reservoir	-	-	-	-	-	33,980	-	33,980	33,980						33,980	33,980	33,980	33,980	33,980
Recreation facilities (initial)	1,760	-	-	-	-	-	-	1,760	1,760						1,450	1,450	1,450	1,450	1,760
Total initial	1,830	-	-	-	-	35,220	-	37,050	37,050	21,889	830	1,216	7,590	26,100	36,600	36,600	36,600	36,600	37,050
Future recreation facilities	450	-	-	-	-	-	-	450	450						300	300	300	300	450
Total, water resource project	2,280	-	-	-	-	-	-	37,500	37,500	21,889	830	1,216	7,590	26,100	36,900	36,900	36,900	36,900	37,500
Development Plan	-	-	-	-	-	-	20,200	20,200	-					20,200	20,200	20,200	20,200	20,200	-
Total construction costs	2,280	-	-	-	-	35,220	20,200	57,700	37,500	21,889	830	1,216	7,590	46,300	57,100	57,100	57,100	57,100	37,500
INVESTMENT COSTS																			
Water Resource Project																			
Initial construction costs	1,830	-	-	-	-	35,220	-	37,050	37,050	21,889	830	1,216	7,590	26,100	36,600	36,600	36,600	36,600	37,050
Interest during construction	100	-	-	-	-	2,290	-	2,390	2,390	1,365	0	0	493	1,700	2,360	2,360	2,360	2,360	2,390
Investment costs, initial inc.	1,930	-	-	-	-	37,510	-	39,440	39,440	23,254	830	1,216	8,083	27,800	38,960	38,960	38,960	38,960	39,440
Future recreation facilities	450	-	-	-	-	-	-	450	450						300	300	300	300	450
Development Plan	-	-	-	-	-	-	20,200	20,200	-					20,200	20,200	20,200	20,200	20,200	-
Total investment costs	2,380	-	-	-	-	37,510	20,200	60,090	39,890	23,254	830	1,216	8,083	48,000	59,460	59,460	59,460	59,460	39,890
ANNUAL FINANCIAL CHARGES																			
Initial increment																			
Interest and amortization	66	-	-	-	-	1,270	1,180	2,516	1,336	788	28	41	274	2,120	2,504	2,504	2,504	2,504	1,336
Operation and maintenance																			
Recreation	68	-	-	-	-	-	-	68	68						68	68	68	68	68
Dam	-	-	-	-	-	50	-	50	50	51	2	2	22	50	50	50	50	50	50
Major replacement																			
Recreation	16	-	-	-	-	-	-	16	16						13	13	13	13	16
Total initial increment	150	-	-	-	-	1,320	1,180	2,650	1,470	839	30	43	296	2,170	2,635	2,635	2,635	2,635	1,470
Future increment (discounted)																			
Interest and amortization	8	-	-	-	-	-	-	8	8					-	5	5	5	5	8
Operation and maintenance	9	-	-	-	-	-	-	9	9					-	9	9	9	9	9
Major replacement	3	-	-	-	-	-	-	3	3					-	1	1	1	1	3
Total, future increment	20	-	-	-	-	-	-	20	20	-	-	-	-	-	15	15	15	15	20
Total annual financial charges	170	-	-	-	-	1,320	1,180	2,670	1,490	839	30	43	296	2,170	2,670	2,670	2,670	2,670	1,490

(1) For pulp mill and Genesee River reach below Gates-Chili-Ogden outfall.
(2) Based on single-purpose project at Stannard site.
(3) Combination of single-purpose project at Stannard site plus one alternative upstream reservoir.
(4) One alternative upstream reservoir.
(5) Based on an estimate for a local protection project.
(6) Based on cost - capacity curve, Exhibit 10-3.

TABLE 10-33

Allocation of Costs ($1,000), Separable Costs-

Remaining Benefits Method, Stannard Reservoir

	Item	User effects					Regional expansion effects	Total
		Recreation	Water quality	Water supply	Irrigation	Flood control		
1.	Benefits	1,120	909	30	56	30	5,050	7,195
2.	Alternative costs	1,490	839	30	43	296	2,670	5,368
3.	Benefits limited	1,120	839	30	43	30	2,670	4,732
4.	Separable costs	500	0	0	0	0	1,180	1,680
5.	Remaining benefits	620	839	30	43	30	1,490	3,052
6.	Ratio	0.203	0.275	0.010	0.014	0.010	0.488	1.000
7.	Allocated joint costs	201	272	10	14	10	483	1,020
8.	Total allocated financial costs	701	272	10	14	10	1,663	2,670
			Allocation of operation, maintenance and replacement costs					
9.	Separable OM & R charges	96	-	-	-	-	-	96
10.	Allocated joint OM & R	10.1	13.8	0.5	0.7	0.5	24.2	50
11.	Total allocated OM & R	106.1	13.8	0.5	0.7	0.5	24.4	146
				Allocation of investment costs				
12.	Annual investment costs	594.9	258.2	9.5	13.3	9.5	1,638.6	2,524
13.	Capitalized investment costs	17,559	7,621	280	393	280	33,736	59,869
14.	Adjusted for dis. on future inc.	221	-	-	-	-	-	221
15.	Total allocated investment costs	17,296	7,621	280	393	280	33,736	60,090
				Allocation of construction costs				
16.	Investment in specific-use lands & fac.	2,380	-	-	-	-	20,200	22,580
17.	Investment in joint-use lands & fac.	15,400	7,621	280	393	280	13,536	37,510
18.	Interest on joint-use lands & fac.	940	465	17	24	17	827	2,290
19.	Allocation const. costs - joint-use lands & facilities	14,460	7,156	263	369	263	12,709	35,220
20.	Construction costs of specific-use lands & facilities	2,280	-	-	-	-	20,200	22,480
21.	Total allocation const. costs	16,740	7,156	263	369	263	32,909	57,700
22.	Const. costs of future inc.	450	-	-	-	-	-	450
23.	Const. costs of dev. plan	-	-	-	-	-	20,200	20,200
24.	Const. costs of water res. proj.-int.	16,290	7,156	263	369	263	12,709	37,050
25.	Total const. cost of water project	16,740	7,156	263	369	263	12,709	37,500

SECTION VII - COST SHARING

22. GOVERNING LEGISLATION

Apportionment of costs for the potential multiple-purpose Stannard Reservoir project between Federal and non-Federal interests is made according to the following criteria and summarized in table 10-34.

a. All costs allocated to flood control are apportioned to the Federal Government in accordance with Section 201 of the Flood Control Act of 1958 (P.L. 85-500). The effects of the project are widespread in the sense of economic impact over the study area and along the Genesee River as far downstream as Belmont.

b. When benefits are widespread, all costs allocated to water quality are apportioned to the Federal Government according to the Water Pollution Control Act of 1961 (P.L. 87-88). During advanced engineering and design, further studies will be made to determine the extent of water quality benefits.

c. All costs allocated to water supply are apportioned to non-Federal interests in accordance with the provisions of the Water Supply Act of 1958 as amended.

d. Construction costs allocated to irrigation are divided between Federal and non-Federal interests on a 50-50 basis. Non-Federal interests are apportioned all operation, maintenance, and replacement costs allocated to irrigation.

e. The separable first costs associated with recreation development in the reservoir are divided between Federal and non-Federal interests on a 50-50 basis. Non-Federal interests are apportioned all specific operation and maintenance costs associated with this feature. This is in accordance with the Federal Water Project Recreation Act (P.L. 89-72).

f. All costs of the water resource project allocated to the purpose of regional expansion effects are apportioned to the Federal Government. This is in accordance with guidance furnished by the Office of Appalachian Studies, Corps of Engineers.

23. APPORTIONED COSTS

A summary of the apportionment of costs between Federal and non-Federal interests is presented in table 10-34.

TABLE 10-34
APPORTIONMENT OF COSTS BETWEEN FEDERAL AND
NON-FEDERAL INTERESTS FOR STANNARD RESERVOIR

Item	Construction Costs ($1,000)			Annual Operation, Maintenance and Replacement Charges ($1,000)		
	Federal	Non-Federal	Total	Federal	Non-Federal	Total
	$	$	$	$	$	$
Flood control	263	-	263	0.5	-	0.5
Recreation	11,040	5,700	16,740	10.1	96	106.1
Water quality	7,156	-	7,156	13.8	-	13.8
Water supply	-	263	263	-	0.5	0.5
Irrigation	184.5	184.5	369	-	0.7	0.7
Regional income expansion	12,709	-	12,709	24.4	-	24.4
TOTAL	31,352.5	6,147.5	37,500	48.8	97.2	146.0

24. STATE AND LOCAL ASSURANCES

Construction of the Stannard Reservoir Project would require local cooperation for all functions. Prior to initiation of construction, responsible local interests would be required to give assurances satisfactory to the Secretary of the Army that they will:

a. Repay all costs allocated to water supply in accordance with the Water Supply Act of 1958, as amended, presently estimated at $263,000 for construction and $500 annually for operation, maintenance, and replacements;

b. In accordance with the Federal Water Project Recreation Act of 1965, Public Law 89-72:

(1) Administer project lands, facilities and water areas for recreation including fish and wildlife enhancement and assure access to such development to all on equal terms;

(2) Pay, contribute in kind, or repay (which may be through user fees) with interest, no less than one-half of the separable first costs allocated to recreation, this one-half presently estimated at $5,700,000;

(3) Bear all costs of operation, maintenance and replacements of fish and wildlife and recreation use lands and facilities, presently estimated at $96,000 annually;

c. Repay 50 percent of all construction costs allocated to irrigation, presently estimated at $184,500, and bear all costs of operation and maintenance, estimated at $700 annually;

d. Hold and save the United States free from damages resulting from water-rights claims due to construction and operation of the project;

e. Exercise to the full extent of their legal capability, control against removal of streamflow made available for water quality control;

f. Contribute to the control of pollution of streams subject to low-flow augmentation by adequate treatment or other methods of controlling wastes at their source; and

g. Within statutory limits, adopt and enforce floodplain management regulations to guide future developments within the floodplain away from locations which are threatened by flood hazards to minimize future flood damages.

The Conservation Commissioner, who is Chairman, State of New York Water Resources Commission, Conservation Department, has indicated the State's intent to provide all necessary assurances required for the Stannard Reservoir project. The Chairman's letter is included as exhibit 10-12.

STATE OF NEW YORK

WATER RESOURCES COMMISSION

CONSERVATION DEPARTMENT, ALBANY, NEW YORK 12226

May 2, 1969

Colonel John C. H. Lee, Jr.
Director
Office of Appalachia Studies
Department of the Army
Corps of Engineers
P.O. Box 1159
Cincinnati, Ohio 45201

Dear Colonel Lee:

Multi-purpose Stannard Reservoir
Project, Genesee River Basin

Reference is made to the draft report recently prepared by the Buffalo District Corps of Engineers and the discussions with New York State representatives relative to the inclusion of the subject project for authorization in the report of the Water Development Coordinating Committee for Appalachia.

At its meeting on May 1, 1969, the New York State Water Resources Commission recommended that this cooperative project be advanced for Federal authorization with the assurance by the State of New York, through the Water Resources Commission, that the appropriate hearings will be held at a time mutually agreed upon as discussed hereinafter.

Prior to initiation of construction, the Water Resources Commission, to the extent authorized by Conservation Law, Section 428, will give the necessary assurances for non-federal participation satisfactory to the Secretary of the Army and subject to the appropriation and availability of funds.

Section 428 provides:

> "The water resources commission is designated as the agent of the state to obtain the cooperation, aid and assistance of any appropriate federal agencies in the performance of the functions of the commission or of any regional planning development board created under part five of this article. The commission may enter into contracts, when required, with any such federal agencies for such purpose.

"Wherever it is required by federal statute, rule or regulation that such cooperation, aid and assistance can be given on a matching-fund basis, the commission, if funds have been appropriated and are available therefor, is designated as the agent of the state to enter into contracts on said basis; provided, however, that payment by the state shall not exceed one-half of the cost, including personal service, of the services rendered by the federal agencies. All contracts entered into by the commission shall be executed by its chairman and in the manner and form prescribed by law."

The Commission proposed that before this matter goes to public hearings the Genesee River Basin Regional Water Resources Planning Board (recently established under Part V, Article 5, N.Y.S. Conservation Law) be given the opportunity to review the subject project and various alternatives related to coordinated Basin planning. The Board, composed of seven local leaders in six counties of the Genesee Basin, will meet for the first time in the first week of June 1969. Consequently, the Board will not have time to consider the project. Without Board support as evidence of local participation and approval, it is doubtful the real citizen support for the project can be generated.

This letter of intent of the State of New York is submitted as an expression of non-Federal interest and cooperation in seeking Federal authorization for the subject project as part of the unprecedented Appalachia program.

Sincerely,

Stewart Udall [signature]

Chairman

cc: District Engineer, Buffalo Corps of Engineers
Mr. Charles Lanigan, Director
Office of Planning Coordination
Mr. F. W. Montanari, N.Y.S. Representative
Appalachia Water Resources Study

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SECTION VIII - COORDINATION IN PLANNING

25. FEDERAL AGENCIES

During planning, studies were coordinated with the Federal Departments of Agriculture and Interior. Several agencies made special studies as an aid in formulation and evaluation of the plan of development. Reports of these agencies are included in the appropriate appendices to this report. The following paragraphs present recommendations or views of participating agencies, and actions taken.

Bureau of Outdoor Recreation - The BOR prepared a preliminary evaluation of the recreational opportunities of the Stannard Reservoir project. The Corps of Engineers allocated the reservoir storage to limit the drawdown to enhance the recreation benefits of the project and included costs for recreational facilities in the plan of development.

Federal Water Pollution Control Administration - FWPCA made a preliminary estimate of the water quality requirements for the Genesee River below the proposed pulp and paper mill below Wellsville. FWPCA determined that the preferred location, from the water quality standpoint, is about five miles downstream, near Scio. This would provide adequate assimilation for the Village of Wellsville's waste. Under the Genesee River Basin study, the FWPCA evaluated the annual costs for advanced treatment at Gates-Chili-Ogden. Subsequently, FWPCA has raised questions concerning the magnitude of flows required for quality control, associated storage requirements, and benefits to be credited to this purpose. Therefore, a complete reappraisal of this aspect of the project will be made in connection with detailed engineering studies to follow.

Bureau of Mines - The BOM inventoried the mineral resources of this area, in connection with the project study. Their report concludes that the site does not conflict with any known mines, quarries, or wells, and no known mineral resources are likely to be lost as a result of the dam and reservoir construction. Consolidated Gas Supply Corp.'s double-line natural gas pipeline which crosses the proposed reservoir area would have to be relocated or modified for underwater service.

Soil Conservation Service - Under the Genesee River Basin study, the SCS evaluated the cost of storage at several reservoir sites in the Genesee Basin, some of which were considered as alternative single-purpose projects. SCS also furnished information on irrigation benefits for agriculture.

Fish and Wildlife Service - The Bureau of Sport Fisheries and Wildlife evaluated the man-days of fishing and hunting afforded by the stream and its contiguous area. The Bureau's recommendations included the development of fisherman access, stocking the reservoir, and that public hunting and wildlife habitat management be a part of the land-use program, consistent with other purposes of the project, on all Federally-owned lands acquired in conjunction with the Stannard Reservoir project. The Corps of Engineers included costs for suitable facilities in the plan of initial development.

National Park Service - The National Park Service cooperated with the Corps of Engineers in investigating the project area to determine the quantity and quality of the sites and materials of historical or archaeological importance. Their report does not list any outstanding archaeological, historic or natural science values in the proposed reservoir area. Additional cost of archaeological and historical survey and salvage was added as a project cost.

26. STATE AGENCIES

The State of New York Conservation Department, Division of Water Resources assisted in the study and report by providing information and data on the proposed pulp and paper mill and its potential impact on the Wellsville area.

27. LOCAL GROUPS

Continuing studies under a regional board in the Genesee River Basin will provide additional information on the use of the proposed project as a source of future municipal and industrial water.

28. PUBLIC HEARINGS

Four public hearings and one information meeting were held in conjunction with the Genesee River Basin Study.

Initial Hearings. The first two, held on the 18th and 19th of June, 1963, in Rochester and Wellsville, New York, respectively were Public Hearings. They were joint hearings conducted by the Genesee River Basin Coordinating Committee and the State of New York Water Resources Commission. Attendance at each of these meetings was approximately 125 persons. Private individuals comprised 10% of those present at Rochester and 30% at Wellsville. Representatives of Industry comprised 10% of those present at both hearings and the remainder of those present represented Federal, State, County and municipal agencies as well as various civic organizations. The primary purpose in holding the hearings, as expressed to those present was to obtain everyone's opinions on the needs for development of water and related land resources in the Genesee River Basin and suggestions as to how these needs might be met.

Information Meeting. On the evening of 21 June 1966, a Public Information meeting was held by the Genesee River Basin Coordinating Committee, in Mount Morris Center School auditorium, Mount Morris, New York. The purpose of this information meeting was to present to the people of the basin the current study progress, show the ultimate goals and objectives of the study and provide an opportunity for members of the audience to ask questions. Attendance at this meeting was approximately 200 persons. Private individuals comprised nearly 30% of those present. Representatives of industry comprised 10% and the remainder of those present represented Federal, State, County, and municipal

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agencies as well as various civic organizations.

Final Basin Study Hearings. The last two Public Hearings were held on 25 and 26 October 1967, at Mount Morris and Rochester, New York. The hearings were held by the Genesee River Basin Coordinating Committee with Colonel A. L. Wright, U. S. Army Corps of Engineers and Mr. F. W. Montanari, Assistant Commissioner, Conservation Department, New York State as co-chairmen. There were approximately 900 persons at the Mount Morris hearing and 300 persons at the Rochester meeting. Most persons requesting to be heard were allowed to speak and many of the questions submitted were answered.

The hearings were held to consider the proposed basin plan resulting from the comprehensive study, but the key item of interest in the proposed basin plan was the multiple-purpose Portage reservoir. The overwhelming consensus of those present was in opposition to the Portage reservoir, in fact there were no speakers in favor of the reservoir. Testimony presented indicated, however, that majority were not opposed in general to the other elements of the basin plan.

Impact of Final Hearing on Plan. As a result of the two hearings on the proposed Basin Plan, the Coordinating Committee members met and reviewed the testimony. The intense local and Congressional opposition is based on the very understandable desire of the inhabitants of the valley not to be displaced from their homes and livelihood. This type of opposition was expected and is typical in water resource projects. It has not been a bar to projects where benefits are realized by others, which, in the judgment of policymakers outweigh the disadvantages to those being displaced. However, in the case of this project, no support was expressed by those who stand to benefit from its construction. Accordingly, the Coordinating Committee concludes that they prefer to forego the benefits, realizing that the recreation, power and water quality needs that could have been met by the project will go unfulfilled or will be accomplished in some other way at some greater economic cost. The Coordinating Committee, therefore, further concludes that the project should be deferred from being recommended as part of the early-action program. However, because it was the consensus of the members that Portage is an excellent site for a multiple-purpose reservoir development, and because a large part of the Basin's needs will not be met, additional studies appear warranted. These studies should include possible alternative sites for water-oriented recreation, a smaller scale of recreational development, development of the site by other than the Federal Government, a complete agricultural impact study and possible use for other purposes such as water supply.

The State of New York and the several counties of the Genesee Basin have subsequent to the public hearings formed the Genesee Basin Regional Board. This Board should give high priority to the re-evaluation of Portage.

The hearings demonstrated that the other recommendations of the proposed Basin Plan were, in general, acceptable to the public. Therefore, the consensus of the Coordinating Committee was to include these items in the early-action plan for recommendation.

Stannard Reservoir Project Hearing - Due to the recent organization of the Genesee River Basin Regional Water Resources Planning Board, a hearing has not yet been held on the potential Stannard Reservoir Project. The Board is considering the merits of the Stannard project as presented herein and various alternatives related to coordinated basin planning. A hearing on the Stannard project will be held in early spring of 1970 at the earliest.

29. A PROCEDURE FOR PROJECT IMPLEMENTATION

Conversion of the plan of development for the upper Genesee River, as proposed herein, to a reality will require close coordination with the State of New York, the Commonwealth of Pennsylvania, and the Bureau of Outdoor Recreation. The Bureau of Outdoor Recreation could prepare a detailed supporting plan for the recreation facilities.

The Corps of Engineers and the State of New York will assume overall responsibility for coordinating and implementing the plan. For purposes of implementation, the plan can be divided into four basic parts as follows:

a. Land acquisition for the entire resource plan.

b. Construction of Stannard Dam and Reservoir exclusive of ultimate recreation development.

c. Construction of ultimate recreation development associated with Stannard Reservoir.

d. Operation and maintenance of the constructed works.

The State of New York would acquire all lands necessary in New York State, which are not now in public ownership, and would be reimbursed by the Federal government for the land costs. The Federal government would acquire all lands necessary in the Commonwealth of Pennsylvania. The Corps of Engineers would construct the Stannard Dam and Reservoir including all initial recreation facilities around the reservoir. Operation and maintenance of the dam and reservoir would be the responsibility of the Corps, except for the recreation, water supply, and irrigation facilities.

A master plan for recreation development of Stannard would be worked out with the Bureau of Outdoor Recreation and the State of New York. The State of New York would construct additional recreation facilities as they are needed and would operate and maintain the initial facilities as well as those they construct after project completion. Federal funds amounting to one-half of the first costs of future recreational facilities would be transferred to the State of New York for the construction.

SECTION IX - CONCLUSIONS

30. CONCLUSIONS

The management of the streamflow of the upper Genesee River to alleviate flood damages, to provide water for water supply, water quality control, and irrigation, to provide water-based recreation opportunities, and to provide the products of related land and water management is required to sustain and enhance the economic well-being of the Wellsville area and Allegany County. This development would have no permanent harmful effects on the services and functions of the states or local governments involved and would be compatible with any plan developed for the Genesee Basin.

The water resource project consists of construction of the multiple-purpose reservoir and initial and future recreation facilities. This is estimated to have a total construction cost of 37.5 million dollars. It is estimated that this investment would create an associated investment of approximately 20.2 million dollars. Benefits for the objective of increasing national income are estimated at approximately 2.1 million dollars annually. Benefits that would have regional impact are estimated to be approximately 5.1 million dollars annually.

Implementation of the plan for development of the upper Genesee River as outlined in this chapter will require the joint efforts of the U. S. Army Corps of Engineers, the State of New York, and the Commonwealth of Pennsylvania. These three agencies will need help in the advanced planning process from other Federal agencies such as the Bureau of Outdoor Recreation, the U. S. Fish and Wildlife Service, and the Federal Water Pollution Control Administration.

The State of New York has reviewed the proposed plan of development and is generally in agreement with it. Their views and intent to provide assurances for items of local cooperation are attached in exhibit 10-12.

STATE OF NEW YORK
CONSERVATION DEPARTMENT *Division of Water Resources*

R. STEWART KILBORNE
Commissioner
W. MASON LAWRENCE
Deputy Commissioner
ROBERT E. YOUNG
Deputy Commissioner
LEIGHTON A. HOPE
Secretary

Mailing Address: STATE OFFICE BUILDING CAMPUS
ALBANY, NEW YORK 12226
[redacted]

F. W. Montanari
Assistant Commissioner
Director
Nicholas L. Barbarossa
Assistant Director
John C. Thompson
Director of Administration
Edwin L. Vopelak
Director of Planning

September 18, 1967

District Engineer
Buffalo District
Corps of Engineers
Foot of Bridge Street
Buffalo, New York 14207

Dear Sir:

The attached report entitled, "Economic Potential of Stannard Dam and Reservoir as Site for Pulp and Paper Mill," is for your information and use. This report provides further justification for construction of the Stannard project.

Because of time and staff limitations, we were unable to do a more complete appraisal of the economic potential of this project in terms of Appalachian Act criteria and the Evaluation Procedures manual.

Should you have any questions concerning this report, I suggest you call Mr. Carson of this office at (AC) 518, GL-7-3120.

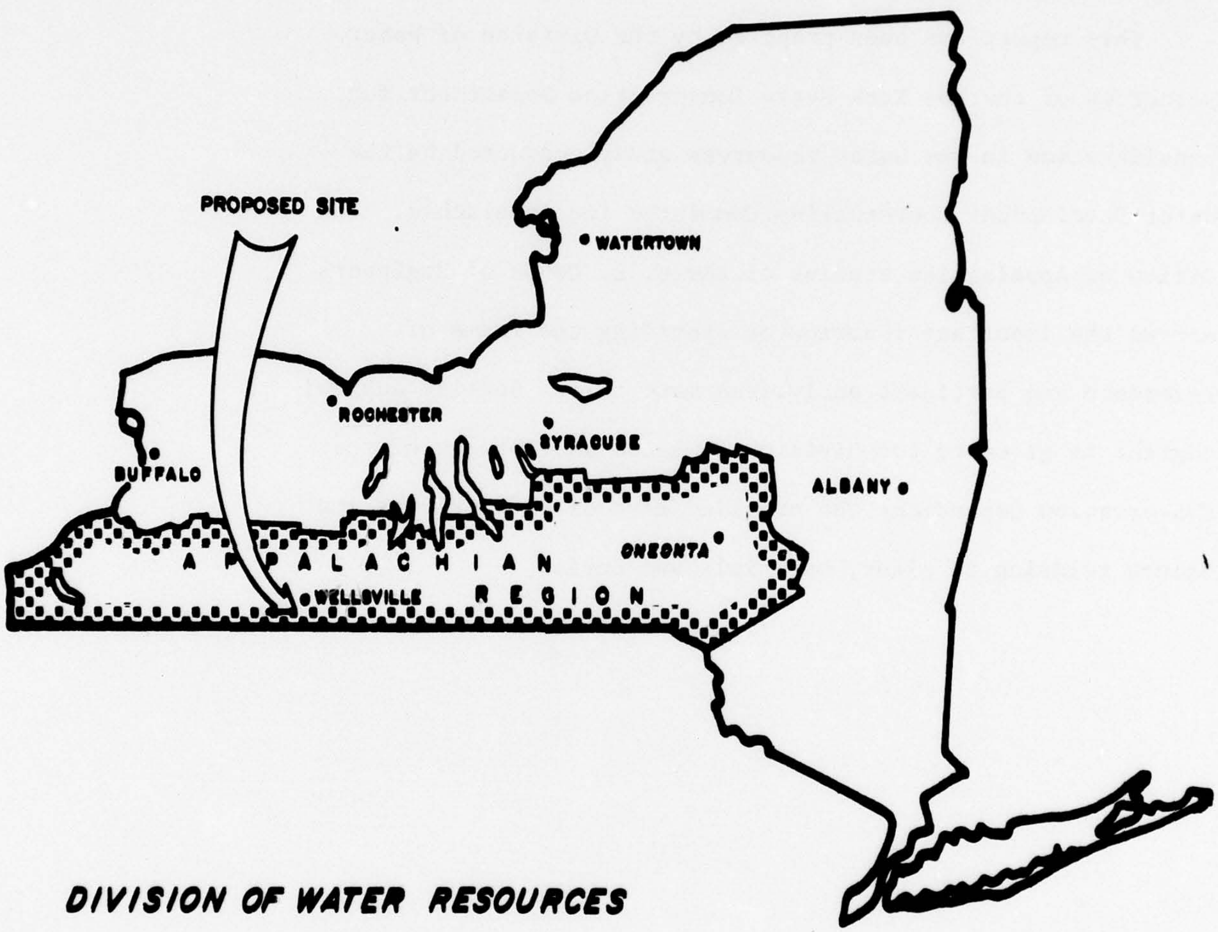
Cordially,

F. W. Montanari
NYS Representative
Water Development Coordinating
Committee for Appalachia

Attachment
cc w/attachment
Honorable Charles T. Lanigan, OPC
Commissioner Ronald B. Peterson, Commerce
Colonel J. C. H. Lee, Jr.
Mr. W. D. Mulholland
Mr. Robert D. Hennigan, Health

ECONOMIC POTENTIAL of STANNARD DAM and RESERVOIR

as site for pulp and paper mill



DIVISION OF WATER RESOURCES

NEW YORK STATE CONSERVATION DEPARTMENT

SEPT. 1967

A C K N O W L E D G M E N T S

This report has been prepared by the Division of Water Resources of the New York State Conservation Department for consideration in the water resources study conducted by the Water Development Coordinating Committee for Appalachia. The Office of Appalachian Studies of the U. S. Corps of Engineers served the important function of providing the frame of reference and pertinent analytical materials. Special acknowledgment is given to the Division of Lands and Forests of the Conservation Department who provided most of the insights and values relating to plant, materials and costs.

ECONOMIC POTENTIAL

of

STANNARD DAM AND RESERVOIR

as

SITE FOR PULP AND PAPER MILL

I. SUMMARY

The Stannard Dam and Reservoir in the Genesee River Basin, to be recommended to the Corps of Engineers for inclusion in its plan of development of water resources in Appalachia, has obvious potential as a base for industrial development.

The construction of this project would make practicable, for example, the erection and operation of a competitive, moderately scaled, integrated paper plant utilizing the latent resources - both human and natural - in this section of Appalachia.

It is estimated that the minimum annual local regional benefits of a 100 to 125 ton per day capacity sulphate pulp and paper mill - as exemplified by the annual wage bill for some 450 to nearly 600 woodsmen, mill workers, and supporting 'service' fields employees - would range from about $3,000,000 to $3,800,000 at present to nearly double or more as real income grows in the next 50 years.

Additional sizeable benefits for the local area would obviously be well within the range of possibilities, particularly if such a plant serves as the base for further industrialization.

The probable annual cost of constructing the Stannard Dam and Reservoir conservatively would approximate from $850,000 to $1,000,000 depending upon the adopted amortization plan.

Significant proportions of these latter costs would logically be charged off against benefits not mentioned above, such as for water quality management, recreation, power and fish and wildlife.

Present timber stands in private woodlots and State forests within an economic procurement radius of 40 miles of each of the many sites available between Belmont and the Stannard Reservoir apparently can supply the annual wood requirements of such a pulp and paper mill for a minumum of 20 years. Forest management would be expected to increase the annual supply indefinitely beyond the 20 years.

Daily water requirements for the size of pulp and paper mill considered in this analysis would range from approximately 50 to 70 million gallons per day (78 cfs to 110 cfs). Of this amount about 9 to 11.25 million gallons per day (14 cfs to 17.5 cfs) would be for process water and the remainder for water quality management. It should be noted that the nutrients in pulp and paper mill wastes may have adverse effects on the water quality damage downstream of the Stannard Site.

II. INTRODUCTION

The forest resources of the Appalachian Region of New York State can support several viable pulp and paper mills or particle board plants.

This report is an appraisal of the potential for development of these wood-using industries in conjunction with the construction of the proposed Stannard Dam and Reservoir on the Genesee River, south of the City of Wellsville.

A sulphate or kraft process plant was selected for this appraisal because this process is predominant in the Nation as well as in Appalachia.

The availability of pulp wood within economic transport range of Stannard limits the size of a sulphate plant that could be installed in this area to 125 ton per day capacity.

Professor Allan F. Horn of the New York State College of Forestry at Syracuse University stated in a 1962 report that a mill capacity of 100 tons per day was the minimum economic unit of production. Appendix A of Report No. 1 of the Appalachian Location Research Studies Program prepared by Fantus Company, Inc. shows that some one-third of the existing pulp mills in the Appalachian Region and one-half of the paper or board plants have capacities of from 8 tons per day to 150 tons per day.

The average discharge for 49 years of record of the Genesee River at Scio about 3 miles downstream from Wellsville, is about 380 cfs with maximum and minimum flows of 23,300 cfs and 5.8 cfs. The construction of the Stannard Dam and Reservoir with provisions for low flow augmentation for the Rochester area would, in effect, level off the peak discharges and possibly provide a daily average flow well within the range of requirements for a sulphate pulp and paper mill of the size considered in this appraisal.

The area between Wellsville and Belmont is the prime location in the westerly portion of the Appalachian Region of New York State for a pulp and paper mill or particle board plant because of labor and transportation. The availability of round-wood for pulp and a dependable water supply are the only factors that would limit the size of a sulphate pulp and paper mill in this area. With a dependable water supply the available round-wood for pulp would support a 100 to 125 ton capacity plant. Other areas of southwestern New York could supply larger quantities of round-wood but the labor supply and transportation facilities might preclude the construction of a plant.

Adequate transportation facilities make the markets of the Atlantic Seaboard readily accessible to the Wellsville area.

The provision of flow regulation in the Stannard reservoir, whether it be considered as low flow augmentation for water quality control or industrial water supply, would create a better climate in the Wellsville area for attracting industry. The competitive position of the area would be improved greatly in that the type of wood using industry that could locate there no longer would be restricted to paper mills alone. Other large water using industries including integrated pulp and paper mills will find the area attractive.

III. POTENTIAL IMPACT OF INTEGRATED PAPER MILL

The Division of Lands and Forests of the New York State Department of Conservation receives several inquiries a year from industrial management requesting information concerning sites having potential for the erection of integrated pulp and paper plants.

Past and current economic reconnaissance surveys strongly suggest that construction of the Stannard Dam and Reservoir in southern Allegany County would make available the missing critical site requirement - water - needed to make such a plant economically viable in the vicinity of this impoundment.

The following summarily delineates and evaluates the key locational factors - natural and human - controlling the economic feasibility of an integrated pulp and paper mill in this area.

A. Scale, Type, and Cost of Mill:

1. It is probable that a new, viable, competitive mill in the Wellsville area would be scaled at from 100 to 125 tons capacity per day.

2. The new facility would either utilize the most prevalent sulphate (Kraft) or the rapidly growing semichemical process. While the sulphate process permits a wider range and higher quality of products than the semi-chemical technique at a higher cost, both types of installation are competitive in the growing paper products field.

   The new mill would be integrated and produce its own pulp for conversion to scheduled varieties of paper products in automated, continuous process, around the clock operations.

3. Recent experience indicates that the current cost of erecting both sulphate and recovery semichemical, capitol

intensive, integrated mills runs from $70,000 to $100,000 per ton of capacity. Consequently, the total cost of such a mill in the 100 to 125 ton capacity per day class would range from roughly $7,000,000 to $12,500,000.

While it is not possible to allocate the local, Appalachian, or national impact of such a private investment for this preliminary presentation, the major part of the labor costs of constructing and at least a minor portion of the other costs would be credited to the local and Appalachian accounts.

B. Major Material Requirements, Availability and Costs

1. Wood is the basic raw material of paper production. The sulphate process requires roughly 1.7 cords of wood input for every ton of paper output, inasmuch as the fiber yield is approximately 50 per cent by weight. Wood requirements for the semichemical process are moderately lower as the pulp yield per ton of wood is somewhat higher.

2. Wood requirements for annual operation - about 330 days - of a sulphate mill of 100 to 125 tons capacity per day totals about 50,000 to 70,000 input cords.

3. There apparently are adequate forest resources in private woodlots and State forests to insure an annual crop of wood for the mill within reasonable economic operating

distances. This should be confirmed this year by a current survey of forest resources within procurement radius of the Stannard Site.

It is estimated that more than 200 acres of woodlot are needed per ton of mill output, or about 25,000 acres of woodlot for a 125 ton capacity per day sulphate mill.

4. The cost of wood delivered at the mill - at $22 per cord in this State - is estimated at approximately $1,100,000 to $1,540,000 per year for the size and type of mill considered.

   Cost distribution analysis indicates that roughly one-tenth of these sums represent the return to the landowner; four-tenths wages for up to 60 woodsmen, 15 truckers, plus some ancillary workers; while the remainder is allocated to other costs.

5. Wages generated within reasonable distance of the mill site by provision of wood inputs would, therefore, range from nearly $450,000 to $615,000 per year for a sulphate unit and moderately less for a semichemical facility.

6. It is not possible at present to quantify and allocate the local and regional impacts of the demand for chemicals, fuel, and similar operating costs.

C. Water Requirements, Availability and Costs

1. Large and consistent quantities of water are required by integrated pulp and paper mills for both processing and the dilution of effluents. The amounts needed vary markedly depending upon the basic process utilized, the scale and age of the facility, the degree of bleaching, etc.

2. The average daily water requirements for the standard operating sulphate mill equals 60,000 gallons for unbleached and 90,000 gallons for bleached ton of pulp.

3. It is estimated that a new sulphate integrated mill of 125 tons daily capacity would utilize a maximum of approximately 9,000,000 gallons of process water for unbleached and 11,250,000 gallons for bleached pulp per day.

   Water requirements of a new semichemical facility of this scale would be substantially lower.

4. These ranges of water demand for processing are well within the capacity of the Stannard Dam and Reservoir.

5. Pulp and paper mill wastes contain nutrients which are not removed in present day treatment facilities. The Federal government is sponsoring research to find economically feasible methods of removing these nutrients from municipal and industrial wastes but until breakthroughs are made the location of a pulp and paper mill anywhere, including near the Stannard Site, may cause adverse effects downstream due to possible changes in water quality.

6. The estimated cost of construction of this dam and reservoir, including real estate and relocation, is currently estimated at $20,000,000. (Preliminary estimates, Genesee River Basin Study).

   The estimated annual cost of this project conservatively would range from between $850,000 and $1,000,000, depending upon the amortization period selected.

   Preliminary cost allocation calculations suggest possibly that up to three-fifths of this annual cost could be charged off against the benefits of fish and wildlife, recreation and power rather than against the mill. It is assumed that a portion of the remaining two-fifths of the cost may be charged off to low flow augmentation which will benefit downstream users at Rochester.

D. Mill Staffing Patterns and Payrolls

1. Present practice in New York State indicates that sulphate mills require roughly 2 and a fraction staff members per ton of capacity per day.

2. An integrated sulphate mill of the size considered here would be staffed by approximately 225 to 280 employees, of whom about four-fifths would be production workers.

   Employment would be only slightly less in a comparably scaled semichemical unit.

Application of current wage rates, hours of work patterns, and weeks of plant operation experience to generally unionized production workers and provision of annual earnings for other employees results in an estimate of current annual payroll of from $1,500,000 to $1,900,000 for either a sulphate or semichemical mill of from 100 to 125 tons capacity.

Virtually all of this annual wage bill would have local area and Appalchian impact.

E. 'Service' Jobs and Payrolls

1. Various studies have indicated that each new manufacturing job in an area generates close to three-quarters of a job on the average in other or 'service' fields of employment - such as housing, transportation, trade, finance, etc. - required to sustain a balanced area economy.

2. It is estimated that about 170 to 210 additional jobs would be created in complementary 'service' fields after an integrated paper mill of the scale and type discussed above becomes operational.

   The payroll for these 170 to 210 'service' jobs would currently approximate from about $1,000,000 to $1,235,000 per year.

F. Benefit/Cost Relationships

1. The local area current annual benefits resulting from the construction and operation of an integrated pulp and paper mill in this vicinity, counting only wages generated locally, would be a minimum of approximately $3,000,000 to $4,000,000, depending upon the scale of operation.

2. It is reasonable to assume, with the expected doubling and even tripling of real income per capita in the next fifty years, that these wage benefits will grow markedly in coming decades.

3. In addition to the wage benefits indicated above, the labor cost of erecting the plant will have a largely local impact. A portion of the other construction costs might well augment local income.

4. Induced additional investment, reflecting the 'multiplier' effect of an operating integrated mill in the area, and the recreational potentials of the reservoir, including fish and wildlife values, could well substantially increase the potential local benefits.

5. In balance, the current conservative Benefit/Cost ratio is about 3 to 1.

IV. APPENDIX

A number of critical locational factors have been discussed in the body of this preliminary survey. Other non-critical locational factors that would not serve as constraints upon the construction and operation of an integrated pulp and paper mill of the scale and types considered for the Wellsville area are:

A. Labor Force

1. Labor requirements, to provide wood - up to 75 woodsmen and truckers, to operate the mill - up to 280 men, and to staff complementary 'service' jobs - up to 210 men and women, can be procured within the commuting range of the plant.
2. Allegany, Cattaraugus and Steuben Counties, largely a farm and rural nonfarm area, experiencing outmigration as job opportunities fail to match natural population growth, have adequate untapped labor reserves - both unemployed and under-employed - to match the prospective demand as it develops.
3. Staff training in pulp and paper mills is traditionally on-the-job. Training in allied industries that may be attracted to the area to supply chemicals and equipment is also largely on-the-job.
4. The New York State Division of Employment manpower training and recruitment services would be available to mill management to help staff the potential facility.

B. Transportation

1. Adequate rail services and highways are available in the area.
2. Woodland access roads would be developed as needed and should not be a constraint.

C. Industrial Sites

1. Management would be offered several alternative sites for the mill and the aid of the industrial site specialists of the New York State Department of Commerce in expediting the selection process.

D. Government and Private Incentives

1. A number of government and private agencies in the State and area stand ready to proffer services and incentives to mill management to locate in this area.

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STATE OF NEW YORK
DEPARTMENT OF COMMERCE
P. O. BOX 7036
ALBANY, N. Y. 12225

WILLIAM E. SEYMOUR
DEPUTY COMMISSIONER

AREA CODE 518
474-6265

May 28, 1969

Colonel John C. H. Lee, Jr.
Director
Office of Appalachia Studies
Department of the Army
Corps of Engineers
P. O. Box 1159
Cincinnati, Ohio 45201

Dear Colonel Lee:

I am writing to you concerning the proposed dam and reservoir project that is being recommended for construction in the Appalachia Water Development Coordinating Committee report.

This project has obvious potential as a base for industrial development, and New York State is vitally interested in having this project constructed. A report prepared by the Division of Water Resources of the State Conservation Department, entitled "Economic Potential of Stannard Dam and Reservoir As Site for Pulp and Paper Mill, September 1967", outlines generally the potential for industrial development. We support the findings of that report.

Within the next two months this Department, in cooperation with the Conservation Department, will be sending a survey questionnaire to some 40 to 50 pulp and paper industries to ascertain interest in locating new plants in the New York State portion of Appalachia. Results from this survey are not expected to be available until late fall of this year. I shall be pleased to make this report available to you.

Sincerely yours,

Wm. Seymour

William E. Seymour
Deputy Commissioner

cc: F. W. Montanari
A. J. Woodford

Sheet 1 of 1
Exhibit 10-14

STATE OF NEW YORK

CONSERVATION DEPARTMENT *Division of Water Resources*

ALBANY, NEW YORK 12226

June 2, 1969

Colonel John C. H. Lee, Jr.
Director
Office of Appalachia Studies
Department of the Army
Corps of Engineers
P. O. Box 1159
Cincinnati, Ohio 45201

Dear Colonel Lee:

This is in regard to your request for more information on the construction and operation of a pulp and paper mill in the Wellsville, New York, area as a result of the construction of the Stannard Reservoir Project.

The area between Wellsville and Belmont, New York, is the prime location in the westerly portion of the Appalachian Region of New York State for a pulp and paper mill or related industry not only because of the adequate rail services and highways in the area but largely because of the availability of both manpower and timber resources.

The New York State Department of Commerce and the Division of Employment of the New York State Labor Department have assured us that the labor market necessary to staff a plant of the proposed scale is readily available. Approximately 240 employees, 75 percent of whom would be production workers, both male and female, would be necessary. In addition, it is estimated that approximately 180 other jobs in service fields such as housing, transportation, trade and finance would be created as a result of a mill and manpower would be soon available to meet these requirements.

A recently completed study by the Division of Lands and Forests of the New York State Conservation Department has proved, positively, that a more than adequate supply of timber resources is presently available to sustain a plant of 100-125 tons per day capacity, for some twenty years. It has also been indicated that, by proper forest management, the supply can be expected to last for an indefinite period beyond these twenty years. Additional studies are now being made by the Division of Lands and Forests in cooperation with the New York State Department of Commerce to determine the possibility of a larger plant, depending on various factors including competing industries in the area and the timber resources within a procurement radius in Pennsylvania.

Finally, and most importantly, the New York State Department of Commerce has had requests for information on the Stannard Reservoir site from existing pulp and paper companies interested in locating a plant in the area.

I hope that this information provides the necessary assurances of the interest of the State of New York in the construction of a pulp and paper mill in the Stannard area. If further information is desired, or if there are questions, I would be pleased to discuss this matter at any time.

Cordially,

Montanari

F. W. Montanari
Assistant Commissioner